ELECTRICAL REVIEW

and WESTERN ELECTRICIAN with which is consolidated ELECTROCRAFT

One Year, United States, $3.00; Canada, $4.00; Foreign Countries, $6.00. Single Copy, 10 cents; back one month, each, 25 cents. Entered as second-class matter, November 7, 1908, at the Post Office at Chicago, Ill., under the Act of March 3, 1879.

VOL. LXVIII, No. 7. CHICAGO, SATURDAY, FEBRUARY 12, 1916. ISSUED WEEKLY

CONTENTS

Electrical Features of a Modern Hotel 280

Construction Details and Electrical Equipment of the New Hotel Vancouver Erected in Vancouver, B. C., Without Affecting Operation of Old Building Which it Replaced.

Compelling Utilities to Serve the Public—By William E. Mooney . 283

Two Recent Court Decisions Affecting Electric Central Stations Establish Important Precedents in Utility Operation.

Central-Station Costs in Massachusetts 285

Compilation of Data on Generating Costs for Electricity in Several Important Steam and Hydroelectric Plants.

Business Building for Electrical Contractors—By George W. Hill . 292

Editorials:
- Trade Conditions....272
- Higher Intensities of Illumination....272
- The Inefficient Horse....272
- Valuation for Taxation and for Rate-Making....273
- Need of Defining Valuation Terms....273
- Organizing for Business Promotion....274
- House-Wiring Campaigns....274
- Maintenance of Resale Prices....274

Happenings in the Industry:
- Railway Men Admit Manufacturers to Their Association....275
- Important Business Resolutions Before Chamber of Commerce....275
- President Wilson Asks Aid of Engineers....276
- American Museum of Safety Awards Medals at Annual Meeting....277
- Moving Transformers with Despatch....277
- Rocky Mountain Municipal Electricians Elect Officers....277
- Mexican Power vs. Man Power....277
- Brooklyn Edison Gives Annual Dinner to Electrical Men....278
- Tacoma and Power Company Agree On Contract....278
- Additional Power Plant Facilities Necessary at Louisville....278
- Puget Sound District Visited by Destructive Storm....278
- Pupin Announces Static Has Been Overcome....278
- Edison's Birthday Celebrated....278
- Miscellaneous News Notes....279

Commercial Practice:
- National House-Wiring Campaign Projected....285
- Reading Gas and Electric Meters Simultaneously Effects Saving of $200 per Month....285
- Electricity Our Best Servant....285
- Co-operating with Real Estate Agents Brings Results in St. Louis....286
- Pittsfield Company Facilitates Renewals....286
- Post Cards Used for Advertising House-wiring Campaign....287
- Municipal Lighting Committee of N. E. L. A. Meets in Cleveland....287
- Salary and Commission Basis Best for Paying Salesmen....287

Power Engineering:
- Selling Power to a Structural Iron Plant....288
- Electric Motor Saves $200 Over Gasoline Costs 289
- Electric Heat for Shoe Machines....289

Electrical Construction:
- Effective Lighting of Bathrooms....290
- Unique Electrical Installation in Boston Armory....290
- Safety Suggestions for Foremen....291
- Locating Trouble on Three-Way Switches....293
- Locating and Removing Grounds in Armatures 294
- Cleaning Brass Mountings on Electrical Apparatus....294
- Connecting Flush-Type Switches....294
- Wiring Old Gas Lamp Posts for Electric Light....294

Dollar Wiring Kinks....295

Electrical Merchandising:
- Window Trimming As a Merchandising Factor 296
- Suggestions for An Expensive Way of Making Your Collections.—By W. B. Parker....297
- Window Display Operated by 12-Year-Old Girl Wins Prize....298
- Referendum on Maintenance of Resale Prices....299

Public Service Commissions....300
New Appliances....301
Industry Activities....307
Latest Approved Fittings....308
Personal and Biographical....309
Current Electrical News....310
Record of Electrical Patents....313

Copyright, 1916, by Electrical Review Publishing Company, Inc.

ELECTRICAL REVIEW PUBLISHING COMPANY, INC.

608 South Dearborn Street, Chicago

President and Treasurer, Charles W. Price. General Manager, A. A. Gray.

Manager Western States, C. W. Forbrich, Chicago. Manager Middle States, J. B. McCarthy, Detroit.

Manager Eastern States, E. E. Wood, 13 Park Row, New York.

Member of Society for Electrical Development, Inc. "Do It Electrically."

EDITORIALS

TRADE CONDITIONS.

Business conditions in the opening month of 1916 were encouraging from almost every viewpoint, and trade was good in nearly all lines. The great demand for steel has forced operation of the steel mills to their maximum capacity and there is still difficulty about securing deliveries. This may yet cause embarrassment to electrical manufacturers. Copper, on the other hand, has reacted from the maximum price and there is little likelihood of trouble from this quarter. The conmbination of large output with high prices has brought large profits to the mines and refineries, but this does not help the electrical industry.

A disinclination to inaugurate large new projects in electrical construction is still evident in financial circles, and the expected improvement in this direction will no doubt be quite gradual. With the metal and textile industries working under pressure and with the agricultural districts enjoying great prosperity, there can be little doubt of good general business conditions in 1916. Prices for securities show an upward trend, and money is plentiful enough for approved investments.

HIGHER INTENSITIES OF ILLUMINATION.

Practice in illuminating engineering tends steadily toward higher intensities of illumination. These higher intensities are not accompanied by higher brilliancies of visible source in well designed installations, for if sources of higher power are utilized, the intrinsic brilliancies are cut down by the use of diffusing media, or by reflection from a diffusing surface. In both direct and indirect systems of illumination, the one or the other means is utilized to avoid the glare which is inseparable from unscreened sources of high brilliancy.

There are several elements which have contributed to this tendency toward higher intensities. The high efficiency of modern illuminants has so reduced the cost of lighting that it has become commercially feasible to utilize greater amounts of light. The rapidly growing number of "white way" systems, especially in business districts, has inspired merchants and others with ideals which demand higher standards indoors also. Industrial concerns have realized the value of more adequate lighting in stimulating output, improving the quality of product, and in preventing accidents. Hence, higher standards of general illumination in factories have been set up. Familiarity with improved conditions in street, store and factory have encouraged the consumer to attain a standard of more and better light at home.

The central-station solicitor or engineer who is satisfied with recommending installations upon a basis which was considered satisfactory a few years ago, is not only missing an opportunity for creating a larger volume of business, but is sowing the seed for dissatisfaction upon the part of the consumer in the near future. With the cost of light production where it is today, there is no good reason why every new installation should not be laid out upon lines which will insure illumination which is adequate from every point of view.

THE INEFFICIENT HORSE.

The present age of unprecedented industrial development has been characterized by the replacement of manual labor by power machinery. The century following the invention of the steam engine has witnessed more and more numerous applications of mechanical power through various forms of machinery to conduct operations previously done by hand. The result has been a marked advance in our material civilization. Transportation has been revolutionized by the same agency. Although the sailing vessel has been in use for centuries, it has been largely superseded by steam for marine propulsion. On land nearly all long-distance transportation is carried on by means of steam or electricity. The mule-drawn canal boat is almost forgotten. In undeveloped mountainous countries, however, the mule must still be depended upon for transport of supplies and products, but this is recognized as a very inefficient method of transportation and becomes superseded whenever the density of traffic becomes great enough to warrant the investment in a railway.

In local urban transportation, the draft animal has been almost entirely superseded for passenger traffic, both public and private, but he still holds his place for the movement of merchandise and it is estimated that there are about 10,000,000 horses still in use in this country in urban service. While the horse compares more favorably with motor power for short hauls than for long-distance transportation, he is nevertheless an inefficient agency even for the former, and this fact is gradually being impressed upon the consciousness of the public. Transportation involves the application of energy, and a large part of our energy is obtained through the combustion of fuel. One form of obtaining energy through the oxidation of organic matter lies in the physiological transformation which goes on in the draft animal, but the most superficial estimate indicates this to be a highly inefficient transformation. Not only is organic food a very expensive fuel, but the percentage

of the energy which is obtained in the form of mechanical work is also very low.

An article by Mr. A. J. Marshall in last week's issue pointed out the great inefficiency involved in the use of draft animals for local transportation in cities, as well as the space economy and sanitary benefits which might be accomplished by the substitution of the electric vehicle where rents are high and where large masses of people are brought together in restricted areas. It seems inevitable that eventually the motor vehicle will entirely displace the horse for such purposes. Among different forms of motor transportation, the electric vehicle has an acknowledged place, since it has been demonstrated many times that for certain types of service it is the most economical and most satisfactory. Its adoption upon a large scale would not only be a great economic gain, but would represent an enormous increase in business for the central stations, and through them for other elements of the electrical industry.

Mr. Marshall has quoted figures indicating that the present load of the central stations of this country would be tripled if horses could be entirely replaced by electric vehicles for urban service. With such possibilities in prospect it would certainly seem worth while for every central station, as well as the vehicle manufacturers themselves, to make an earnest effort for the acceleration of the process of consummating this substitution.

VALUATION FOR TAXATION AND FOR RATE-MAKING.

In valuing a utility property for rate-making purposes the effort is made to determine the actual value of every element of the property and arrive at a total which represents the market value of all tangible property and frequently certain elements of intangible values. Whether such a valuation should include all intangible values and thus correspond to the market value or sale value of the utility is a disputed question which need not be answered. Many students of the subject claim that valuations for rate-making and condemnation purposes should not be the same, as certain intangible elements may properly be included in the latter which are not properly included in the former.

In valuing property for taxation purposes, it is seldom that full value is scheduled. In some communities it is definitely aimed to assess all real estate at a specified fraction of the actual market value. Methods of taxing public service corporations vary in different states. In some cases gross earnings or net earnings are taken as a basis of taxation. Where corporate property is treated as other property and valued for taxation purposes, it will usually be found that, like the property of private owners, it is undervalued to a greater or less degree.

Such conditions are not, however, universal. In a case which came up last year before the Supreme Court of Wisconsin for review of the findings of the Railroad Commission, it was disclosed that a property upon which the Commission placed a valuation of $700,000 had been assessed for taxation purposes at $1,000,000, a discrepancy of 57 per cent. While it is obvious that tax assessments are not made accurately enough to form the basis of a valuation for other purposes, it is equally obvious that when a valuation based upon an inventory is made for rate-making purposes, it may form a substantial basis for a tax assessment, and the latter should never bear it such a relation as stated in the above case. To quote the opinion of the court: "Once the state has fixed a value for rate-making purposes and restricted the earning power of the road to a reasonable return on such value, it would seem reasonable to claim at least that the property could not have a materially higher value for purposes of taxation. While a valuation for taxation purposes may not fix the value for rate-making purposes, it may well be that a valuation for the latter purpose might substantially fix the value to be found for the former." There seems to be an excellent opportunity here for tax commissions and public service commissions to co-operate in carrying out so sensible a rule.

NEED OF DEFINING VALUATION TERMS.

The Valuation Committee of the American Electric Railway Association in a recent report has called attention to the confusion arising in valuation work from the use of the same term by different persons to represent different ideas, and the use of different terms to represent the same ideas. That such a condition has been one cause of the widespread confusion which has arisen in the consideration of this matter will not be disputed. Valuation engineers, accountants, lawyers and judges are all included in this difficulty and it is claimed this is partly responsible for the diversity in the decisions in the highest courts of our different states which has already come about and which is producing an unfortunate state of affairs.

The committee suggested that its own association take up with the Interstate Commerce Commission and associations representing other interested parties, the matter of defining the terms applied in valuation work, so that at least there need be no misunderstanding of the ideas put forward in discussing valuation matters. It would then be easier to really understand the opposing contentions of the different interests involved in valuation cases and come to decisions purely upon the merits of the case.

Certainly such a highly desirable clarification of the atmosphere which at present makes this matter so hazy would be of general advantage, for there are sufficient complications in this subject due to different viewpoints without adding those which may be due to misunderstanding. It is to be hoped that the American Electric Railway Association will take this matter up, or, if it fails to do so, that some other representative body will shoulder an obligation which only awaits a volunteer.

ORGANIZING FOR BUSINESS PROMOTION.

It is only a few years ago when it appeared that the most heinous offense in the eyes of the Government was for a business man to belong to a business organization. So great was the iniquity of business men meeting in conference to establish business standards, to discuss from an ethical point of view ways and means for improving trade relations, and possibly daring to discuss the idea of making a little better profit out of their efforts, that organizations of this kind melted out of sight and their members passed each other upon the street and were impossible of identification except for some, to the uninitiated, passing of the high sign.

For several years business men have been afraid to discuss anything in their business sessions. The fear of government prosecution has to a large extent robbed a manufacturers' or a jobbers' session of a lot of its virility.

In an address before the annual meeting of the Rubber Club of America, at New York City on February 2, Mr. Edward N. Hurley, vice-chairman of the Federal Trade Commission, touched upon these things. Nothing of the foregoing is either his language or sentiment. The thing in this connection of interest at this time lies in the following phrasing: "But today things are different—they are better. Things are really pretty good. The law against restraint of trade has been more fully interpreted by the courts. Business understands more clearly what it may and may not do. The whole tone of the business world has improved under criticism."

Mr. Hurley deplored the unfavorable conditions which exist in certain manufacturing industries. A recent survey of one industry shows that in 1914, 27 of the larger manufacturers, all shipping over $100,000 worth of goods a year, with an aggregate capital stock of $9,000,000, bonds and other indebtedness of $3,500,000 and total sales of $8,500,000, had a net income of only $300,000, which means three and one-third per cent on the capital stock or three and one-half per cent on the sales.

The Federal Trade Commission is confronted with a lack of adequate information regarding industry, and is taking steps to obtain the facts so that remedial suggestions may be made as soon as possible out of the analysis of adequate knowledge of the situation.

Passing over the enumeration of several instances in several industries where the need for collective effort upon the part of the interests involved is easily demonstrated, Mr. Hurley points out the high degree of satisfaction to which manufacturers of every description in Germany have developed co-operative methods. In Germany every important industry is organized into trade associations, and 85 per cent of the manufacturers engaged in those industries are represented in their respective trade associations.

Mr. Hurley says "Germany's success as a commercial and industrial world power is due very largely to the policy of organizing and co-operating, of the working together of its captains of industry, of establishing communities of interest between the small and the big business men for the mutual purpose of promoting trade at home and abroad. The old adage 'In unity there is strength' is put into practice, and has proved to be the backbone of Germany's industrial and commercial achievements, efficiency and strength."

Collective effort has a large opportunity in every industry. There is open a wide field of useful and proper activities. Summing it all up, it appears that the demand for investigation instigated several years ago and the consequent criticism as to the underlying purposes of many of our trade organizations, were due to a misapprehension that these associations were concerned only with the regulation of prices. Under the enlightenment which has come out of the travail men are seeing today as never before the opportunities for organized effort. There need be no dodging and no subterfuges. The welfare of everyone involved in an industrial pursuit, the wage earner as well as the employe and the capitalist, are interested in the regulation of prices. This need not take the form of restraint but of intelligent understanding of all of the conditions involved. A right conception of the share that each element bears to the entire situation and a definite, upstanding coherence to proper standards of business practice will keep business on the right basis and the right basis will regulate prices.

MAINTENANCE OF RESALE PRICES.

The Board of Directors of the Chamber of Commerce of the United States has voted that the report of a special committee of the National Chamber on the maintenance of resale prices shall be submitted to a referendum of the members. At the annual meeting held this week at Washington, D. C., the committee report submitted by Dr. Paul T. Cherington, a professor in the Harvard Graduate School of Business Administration, the majority recommendation favors legislation permitting price maintenance under certain controlling conditions. This report is analyzed quite fully on other pages of this issue.

The advantages argued for and against price maintenance are worthy of careful study, and to all associations of electrical men interested in the question of maintenance of resale prices the referendum of the National Chamber is commended for careful consideration.

HOUSE-WIRING CAMPAIGNS.

The Society for Electrical Development has inaugurated a propaganda for a nation-wide house-wiring campaign this spring, to be known as "Wire Your Home" month. The date designated is for the period from March 15 to April 15, 1916. Already considerable enthusiasm has been aroused among electric light and power companies, manufacturers, electrical supply jobbers, electrical contractors, dealers and consulting engineers. With the recollection of the results achieved by Electrical Prosperity Week we can all of us get behind the present movement with the expectation that intensive effort will be amply repaid by actual cash-in returns.

Happenings in the Industry

Railway Men Admit Manufacturers to Association at Chicago Meeting—Important Resolutions Adopted by Chamber of Commerce Convention—President Wilson Appeals to American Institute to Prepare Industries for War Conditions—SafetyAwards Made —Annual Dinner of Brooklyn Interests—Static Has Been Overcome in Wireless

RAILWAY MEN ADMIT MANUFACTURERS TO THEIR ASSOCIATION.

Midyear Meeting of the American Electric Railway Association.

At the midyear meeting of the American Electric Railway Association, held at the Congress Hotel, Chicago, on February 4, amendments to the constitution and by-laws were adopted which admit manufacturers of railway materials and supply men to membership in the association upon the same terms as the operating members. This consists of a company membership and the only distinction is that there are fewer steps in classification for payment of dues.

Manufacturers and supply men becoming members will pay annual dues of $25 if their gross business in electric railway material is less than $50,000 per annum; if the gross business exceeds $50,000 and is less than $1,000,000 the annual dues will be $125; up to $6,000,000 dues are $325; up to $10,000,000 dues are $525; over $10,000,000 dues are $750.

The morning session of the association was devoted to the subject of "Valuation," the principal paper on this subject being presented by N. T. Guernsey, general counsel of the American Telephone & Telegraph Company. He defined value, discussed how it could be ascertained, and what use should be made of it when ascertained.

Discussions were presented by George Weston, of Chicago, and Philip J. Kealy, of Kansas City. Mr. Weston objected to making use of any of the gross receipts of a utility company for payments into the municipal treasury or for carrying on functions which properly belonged to the municipality, such as taking care of the streets. The entire fare should be devoted to providing service, return upon the investment, maintenance of the property and welfare of employees. Mr. Kealy pointed out some difficulties in applying the method of reproduction cost to valuation and showed why the same methods could not be used in all cases. He emphasized the necessity for clearly defining the terms used in this work in order to avoid the confusion which is developing, even in court decisions.

The afternoon session was devoted to a discussion of "Rate of Return." This discussion was opened by a paper which was written by J. D. Mortimer and read by Mr. Doolittle. This pointed out that capital for extensions could only be secured if the returns from present investments made them as attractive as other possible investments. He discussed the hazards incident to the electric railway business and showed how these affected the stability of the investments.

A paper by D. C. Jackson discussing "Actual Returns in the Past" was read by D. J. McGrath, of the Massachusetts Institute of Technology. This paper was devoted to electric railways in Massachusetts, where the capitalization has been limited closely to actual investments. In 1890 the actual dividend of electric railway companies was 7.1 per cent. From 1901 to 1912 the average was under 5 per cent and at the present time it is 4.7 per cent. At the present time some Massachusetts railways are paying good returns and some are paying none.

A discussion by O. B. Willcox on "Competition with Other Investments" was read by L. S. Storrs. This paper pointed out the differences in the available field for electric railways as compared with industrial enterprises and advocated greater publicity to impressing the public with its own great interest in the railway utilities.

In the evening, a joint banquet was held with the American Electric Railway Manufacturers' Association. Addresses were made by Presidents Charles L. Henry and Thomas Finnigan and by Senator Oscar W. Underwood. The latter's topic was "Public Regulation and our Transportation Systems."

Important Resolutions Affecting Business Presented at Chamber of Commerce Convention.

Among the resolutions submitted to the fourth annual convention of the Chamber of Commerce of the United States held in Washington, D. C., February 8, 9 and 10, were the following:

A proposal by the Cincinnati Chamber of Commerce that "The Federal Reserve Act, which now authorizes national banks to make bankers' acceptances based on export and import trade, be amended to authorize national banks to make such acceptances based on domestic trade and transactions."

A proposal from the Providence Chamber of Commerce to ask Congress to adopt a uniform national incorporation law because of "the enormous development of the foreign trade of the United States which is creating problems and complications increasingly difficult of solution because of the indefinite status of corporations engaged therein, due to the wide diversity of laws."

A petition from the Pittsburgh Chamber of Commerce that the President of the United States and Congress pass a new tariff schedule "tending upward" especially to cover goods made and accumulated abroad during the war.

A move toward "industrial efficiency" from the Boston Chamber of Commerce, criticizing the so-called "Deitrick Amendment" to the army appropriation bill of 1915-1916 "which prohibited the making of time studies and the payment of premiums and bonuses to employees."

A plan from the Chicago Association of Commerce providing for certain construction and inspection safeguards in the merchant marine, among them the creation in the Department of Commerce of a board of naval architects.

A proposal from the Philadelphia Bourse, concerning the recently enacted Seaman's Act, urging the immediate repeal of that law, and all those "sections of our other laws relating to shipping and navigation which handicap our deep-sea merchant marine in world competition for trade on the high seas."

Opposition to government ownership of telegraph and telephone lines, from the Philadelphia Bourse.

In the field of transportation as related to increased military preparedness, the Rome (Ga.) Chamber of Commerce proposes government aid in building of highways and river transportation.

A plan by the American Specialty Manufacturers' Association to amend Federal laws dealing with unfair competition so as to permit independent and individual judicial recourse by persons injured by unfair competition.

PRESIDENT WILSON ASKS AID OF AMERICAN INSTITUTE IN PREPAREDNESS.

Mid-Winter Convention of American Institute of Electrical Engineers at New York Considers Important Topics.

President Wilson has asked the American Institute of Electrical Engineers to nominate a representative from each state to collect data as a basis for organizing our industries in preparedness for war. This was the announcement made by President J. J. Carty in opening the mid-winter convention of the Institute in New York, on Tuesday, February 8.

These representatives are to act with others from the National Societies of Civil, Mechanical and Mining Engineers and Chemists. It is proposed that they will organize the industries for furnishing war munitions.

Following President Carty's address two papers were presented: "The A. I. E. E. and the Technical Committees," by D. B. Rushmore; "Municipally Operated Electric Utilities of Western Canada," by A. G. Christie.

Mr. Rushmore pointed out the unsatisfactory condition which has resulted from the growth and broadening of electrical engineering and made some suggestions with regard to the organization of the technical committees of the Institute so as to meet present needs.

Mr. Christie gave a discussion and analysis of the electric utilities in the cities of Western Canada, including costs, financing, management and charges. He found them usually efficiently managed and free from political interference.

Mr. Rushmore's paper was discussed by Philip Torchio, E. H. Martindale, A. W. Gray, C. F. Scott, William A. Delmar, Louis T. Robinson, Comfort A. Adams, Farley Osgood, Henry G. Stott and J. J. Carty. Many conflicting opinions were brought out. Prof. Christie's paper was discused by Philander Betts, Henry G. Stott, Farley Osgood, Reginald P. Bolton, G. A. Cheney and Clayton H. Sharp. It was brought out that in this country, lack of proper accounting and political interference prevented results being obtained similar to those in western Canada. Centralized reponsibility is also lacking.

At the afternoon session the following papers were presented: "Crest Voltmeters," by C. H. Sharp and E. D. Doyle; "The Crest Voltmeter," by L. W. Chubb; "The Voltmeter Coil in Testing Transformers," by A. B. Hendricks, Jr.; and "Notes on the Measurement of High Voltage," by William R. Work.

Dr. Sharp described an instrument consisting of an electrostatic voltmeter in parallel with a condenser and in series with an electric valve of the kenotron, or vacuum-tube type. Tests show that it will register the peak value of the voltage wave.

Mr. Chubb also uses the hot cathode in a vacuum tube as a valve, but measures the current which flows into a condenser, this current being proportional to the maximum voltage at a given frequency. He points out the advantages of this method over the spark gap for measuring high voltages.

Mr. Hendricks pointed out how a voltmeter coil must be used to give correct values of high voltage. Mr. Work dealt with the same subject, and found this method superior to the measurement of primary voltage or the use of a spark gap. When corrected for crest-factor, the correct maximum voltage may be obtained.

These papers were discussed by E. E. Creighton, F. W. Peek, Jr., F. M. Farmer, Frederick Bedell, Comfort Adams, W. I. Middleton, John R. Craighead, Chester Dawes, John B. Whitehead, L. W. Chubb, Lewis J. Robinson and M. G. Newman.

The advantages and disadvantages of the various methods were pointed out, and other methods of measuring crest voltage were suggested as by observing corona and by using an electrostatic ocillograph.

On Tuesday evening a subscription dinner-dance was given at the Hotel Astor and was well attended.

The session on Wednesday morning was devoted to a symposium on electric railway operation. The following papers were presented: "Operation on the Norfolk & Western Railway," by F. E. Wynne; "Chattering Wheel Slip in Electric Motive Power," by G. M. Eaton; "The Liquid Rheostat in Electric Motive Power," by A. J. Hall.

Mr. Wynne's paper discussed the advantages of electric service in handling coal trains on a division of the Norfolk & Western Railway which includes the Elkhorn tunnel. These are an increase in traffic handled to nearly double, increased safety, smaller number of locomotives required (12 electric in place of 33 Mallets), better control and less delays. Chattering slip was observed on this road by Mr. Eaton, who gave the reasons for it, and the means of measuring and rectifying it. It is characteristic of all types of electric motive power. The liquid rheostat used on the Norfolk & Western locomotives was described by Mr. Hall. The results obtained have demonstrated the advantage of this method of control.

Mr. Wynne's paper was discussed by A. H. Armstrong, R. E. Hellmund, F. P. Shepard, B. A. Rehrend, W. I. Schlichter, C. F. Scott, W. Arthur and H. M. Hobart. The advantages and disadvantages of the constant-speed motor were brought out. There has been less damage to equipment on the Norfolk & Western under electric operation with its better control. Single-phase transmission is used on account of the great objection to two trolleys.

Mr. Eaton's paper was presented by Paul M. Lincoln and was discussed by S. T. Dood, W. I. Slichter, Charles F. Scott and W. L. Merrill.

Mr. Hall's paper was presented by R. E. Hellmund and was discussed by C. D. Knight.

At the final session on Wednesday afternoon the first paper presented was entitled "A Method of Determining the Correctness of Polyphase Wattmeter Connections," by W. B. Kouwenhoven. The author considered the usual methods of checking connections unreliable. This is shown by a mathematical and experimental investigation of the registration under all possible circumstances, the results being tabulated. Rules for correct connections are worked out.

This paper was discussed by W. H. Pratt, George A. Sawin, L. W. Chubb, Comfort A. Adams and Lewis T. Robinson.

The final paper was one by John B. Flowers entitled "The True Nature of Speech." The author has analyzed the speech tones corresponding to the letters of the alphabet, and finds each to be characterized by a definite succession of relative intensities. A string galvanometer and telephone transmitter were used for photographic records. A voice-operated writing machine has been designed which automatically records speech in this phonographic alphabet.

This paper was discussed by H. B. Williams, Lewis Robinson, A. C. Crehore, William Maver, Jr., William J. Hammoer, L. W. Chubb and Comfort A. Adams.

The registration was 363.

Interchange of Power Facilities at Tacoma, Wash.—Two amendments have been introduced in the council, to the ordinance providing for connection between the Municipal Power Plant and the plants of the Stone & Webster Corporation. The amendments provide that the city shall furnish to the Tacoma Railway & Power Company customers current for lighting at the same rate as to the city's regular customers. Also that five minutes' notice must be given each party to the agreement before ceasing the use of current from the other plant. In case of low water in the Nisqually River, the Tacoma Railway & Power Company must serve the city's lighting system.

American Museum of Safety Awards Medals at Its Annual Meeting.

The annual meeting and banquet of the American Museum of Safety was held at the Waldorf-Astoria, New York, N. Y., February 3. President Arthur Williams introduced

Anthony N. Brady Memorial Medal.

the Hon. George B. Cortelyou, who acted as toastmaster. Addresses were delivered by Henry W. Hodge, newly appointed Public Service Commissioner of New York; E. A. Sperry, president of the Sperry Gyroscope Compass Company; W. A. Fairburn, president of the Diamond Match Company, and W. H. Tolman, director of the American Museum of Safety.

Among the medals presented by Professor Hulton, chairman of the Jury of Awards, were those to E. A. Sperry, the Scientific American Medal; and to the Union Traction Company of Indiana, H. A. Nicholl, general manager, the Anthony N. Brady Memorial Medal. A very substantial growth of the Museum of Safety was reported.

Moving Transformers With Despatch.

In Texas where the railroad stations are not so numerous as they are in the North and where sidings are not available it is sometimes necessary on account of large power loads to move transformers long distances.

The steel gin wagon shown in the illustration has been the means of saving much time and labor in hauling heavy machinery in this district where cotton gins constitute a good proportion of the central-station load.

The transformer shown on the wagon is a 400-kilovolt-ampere, 60,000-volt outdoor transformer which was connected to the high-tension transmission lines of the Texas Power & Light Company. By means of the traction engine shown this transformer was moved with little effort.

Traction Engine Moving Large Transformer.

Rocky Mountain Municipal Electricians Elect Officers.

The Rocky Mountain Association of Municipal Electricians, including the States of Colorado, Wyoming, New Mexico and Utah, held its annual convention at the Albany Hotel, Denver, Colo., on January 20 and 21, 1916, which was largely attended.

President C. L. Reasoner, city electrician at Colorado Springs, presided during the early part of the meeting, but was called out of town, and David Reed, superintendent of the Denver Alarm Telegraph System, was appointed chairman pro tem.

The meeting was opened by an address of welcome by Fire Chief Healy of the Denver Fire Department, and after the ordinary business, such as reports of secretary and treasurer, appointment of nominating and other committees, etc., the morning session closed with a general discussion of standard electrical material and appliances.

Thursday afternoon there was a large question box in which a number of important questions regarding municipal wiring discussed.

On Friday, January 21, B. C. J. Wheatlake of the General Electric Company, read a paper on Wiring and Wiring Appliances, which aroused a large amount of discussion among the members, particularly in reference to the new code wiring.

In the afternoon an inspection trip was made to the Denver Gas and Electric Light Company's power-house, and in the evening the members attending were presented with tickets to the National Stock Show.

The meeting closed with the election of the following officers:

President, Lawrence Stone, city electrician of Denver.

First vice-president, David Reed, superintendent of telegraph, Denver.

Second vice-president, G. L. Smith, city electrician, Fort Collins.

Secretary-treasurer, L. A. Varley, Rocky Mountain Fire Underwriters' Association.

Mexican Power vs. Man Power.

Many tales have been told recently in connection with the turbulent scenes on the banks of the Rio Grande in Texas, but here is an illustration from the border that shows another side of the story.

Mexican labor is comparatively cheap in this vicinity and men are frequently employed for various tasks where in a place of high priced labor blocks and tackle would be rigged up.

The photograph shows nine Mexicans pulling a motor up the bank of the river to be used in a new pump house which is to supply water for the generating plant of the International Electric Company.

Mexicans Hauling Motor Up Incline.

Brooklyn Edison Gives Annual Dinner to Electrical Men.

The Edison Electric Illuminating Company of Brooklyn gave its tenth annual dinner to the electrical men of Brooklyn at the Academy of Music, in that borough, February 2, 1916, at seven o'clock. There were over 400 guests, and the large dining hall was beautifully illuminated with colored flood lighting, and the walls were adorned with appropriate electrical mottoes made up of miniature electric lamps.

T. I. Jones, general sales agent of the Edison Electric Illuminating Company, presided, and among others at the guest table were W. F. Wells, vice-president of the Edison Electric Illuminating Company; Hon. Lewis H. Pounds, president of the Borough of Brooklyn; Hon. William Hayward, Public Service Commissioner; Commodore Alfred Brooks Fry, consulting engineer, Department of Water Supply, Gas & Electricity; Louis Kalischer, ex-president of the Kilowatt Club; P. R. Atkinson, Theodore Beran, Frank Conn, H. M. Edwards, J. C. Forsythe, Bernard Gallagher, Thomas E. Murray, W. H. Onken, Jr., Charles W. Price, Frank M. Tait, F. W. Smith and E. W. Voorhies.

There were a number of well known electrical men present, including J. F. Becker, F. C. Bates, Dr. George F. Sever, M. S. Seelman, Jr., H. F. Frasse, E. A. Leslie, Thomas E. Murray, Jr., W. S. Rugg, H. A. Sinclair, George Weiderman, George Weiderman, Jr., and W. H. Wells.

The speakers were called upon gracefully and appropriately by Mr. Jones. They were Messrs. Wells, Pounds, Hayward, Kalischer and Fry, and there was a general tone of appreciation of the Edison method of handling its large business in the Borough of Brooklyn and the excellent growth of the use of electricity.

A unique and interesting feature was the presentation, on a screen at one end of the hall, of portraits of the guests of honor, with a brief history of what they had done in the electrical field.

A number of really quite appropriate parodies on well known songs were sung with enthusiasm. An example of these is shown in the following on "My Old Kentucky Home":

The sun shines bright on my modern Brooklyn home
All summer, all winter we're gay,
The house is wired and electrically equipped
And the maids make music all the day.
My vacuum cleaner glides smoothly o'er and o'er
So neatly, so sweetly, so light
That the kids may now roll around upon the floor,
For my modern Brooklyn home's cleaned right.

Chorus.

Sweep no more, my lady,
O, sweep no more today,
It is half past nine, and the cleaning's done on time
And the old broom's thrown far away.

Tacoma and Power Company Agree on Contract.

Acceptance of the power contract and franchise authorized by the City Council has been filed by the Tacoma Railway & Power Company. Under the terms of the contract the power plants of the Tacoma Railway & Power Company and the Tacoma Municipal plant will be connected for mutual protection. The power company agrees to furnish the municipal plant energy to the amount of 10,000 horsepower; in return, the city will be required, in case of necessity, to furnish only the excess power from the Nisqually plant. In connection with the franchises, the contract includes the extension of the Pacific Avenue line to South Forty-sixth Street by the Power Company, changing the present route of the South Tacoma line over the Tacoma Avenue fill, and the connection of Tacoma Avenue and Point Defiance lines at Division Avenue. The city of Tacoma agrees to restore to the power company its franchise for power which was forfeited some time ago because the power company sold energy for lighting, thereby violating a charter provision, which forbids the sale of energy for lighting by any concern other than the municipal plant.

Additional Power Plant Facilities Necessary at Louisville, Ky.

A bond issue of $1,000,000 is to be issued by the Louisville Gas & Electric Company to provide funds for largely increasing the capacity of its Waterside plant at Louisville, Ky. Plans have been completed to increase the capacity of the plant from 22,000 to 37,000 kilowatts. An addition to the power house will be erected on a site immediately south of the present structure. The existing plant has four units, while the new 15,000-kilowatt plant will have one unit. According to Donald McDonald, vice-president and general manager of the company, the present capacity will soon be exceeded if the present rate of increase continues. Another addition to the plant will be necessary in two or three years.

Puget Sound District Visited by Destructive Storm.

Following the devastating storms that occurred on the California coast during January comes the news of a blizzard in the Puget Sound district last week. The accounts say the heaviest snowfall in thirty years has crippled power and communication lines in that district. The Puget Sound Traction, Light & Power Company's street railway and interurban service at Seattle was completely tied up. Telephone and telegraph communication was maintained only by the greatest effort, and transcontinental railroads made no attempt to run trains through the Cascade Mountains where in some places 19 feet of snow fell.

Later accounts state that the storm period has passed, and power and communication utilities are now nearly returned to normal conditions.

Pupin Announces Static Has Been Overcome.

The New York Electrical Society held a notable meeting at the Engineering Societies Building, New York City, on January 27, when Michael I. Pupin spoke on "Wireless Transmission Problems." The audience numbered over 300.

The address was remarkable in many respects. Not only were various problems involved in the recent new triumphs in long-distance talk transmission analyzed and solved with a simplicity and clarity which delighted those who had the good fortune to be present, but Dr. Pupin stated that one of the greatest discoveries in history, the conquest of the menace and bugbear of all time—the static—was about to be given to the world, and he said that this discovery, which had cost him seven years of experimentation, not to mention the work of others, will make possible the transmission of messages by wireless telephone to every part of the world.

The following life members were elected: Bion J. Arnold, Putnam A. Bates, P. G. Gossler, H. G. Stott, John Bottomley, Francis B. Crocker.

Edison's Sixty-Ninth Birthday Celebrated by Employees.

The Edison Club, composed of 600 employees of Thomas A. Edison, celebrated with a banquet at Newark, N. J., February 5, the sixty-ninth birthday of the inventor, which occurred February 11.

Hudson Maxim made the only set speech of the evening. He eulogized Mr. Edison as the man who has done more for his fellows than any other, also giving him credit for the formation of the Naval Consulting Board, of which he is chairman. Dr. M. R. Hutchinson, Mr. Edison's chief engineer and president of the club, was toastmaster. One of the distinguished guests was Rear Admiral O. Dyntson, of the Russian Navy, who proposed a toast to Mr. Edison.

Miscellaneous News Notes

Summer Convention of Electrical Engineers.—The annual convention of the American Institute of Electrical Engineers will be held this year at Cleveland, O., during the last week in June.

Iron and Steel Engineers Meet in Chicago.—The annual convention of the Association of Iron and Steel Electrical Engineers will be held this year in Chicago and the time has been set as September 18 to 22.

Detroit to Use Canadian Power.—The Federal Light & Power Company of Windsor, Ont., has received permission from the United States government to lay cables in the Detroit River for the purpose of transmitting electric power from Ontario to Detroit and vicinity.

Electric Heaters for Traffic Police.—The city of Lancaster, Pa., has been conducting experiments with electric heaters for use by traffic police. One has been installed in a manhole of the Edison Electric Company's system, and has proven so successful that others will be added.

New Mexico Association Will Meet in February.—The second annual convention of the New Mexico Electrical Association will be held in Albuquerque, N. M., February 14, 15 and 16, with headquarters at the Alvarado Hotel. C. M. Einhart is president of the Association and E. A. Thiele of Roswell, N. M. is secretary and treasurer.

Electrical Organization for South Dakota.—Central station owners and operators in the state of South Dakota propose to organize an electrical association, and a preliminary meeting for that purpose has been called for February 22, at the Hotel Carpenter, Sioux Falls, S. D.

Power Company Gives Dinner.—The Greenville (Ohio) Electric Light & Power Company was host at a "co-operation dinner" given in Greenville February 2. D. L. Gaskill, secretary of the company, reports a very enthusiastic gathering of men of the electrical industry enjoyed the occasion.

Sullivan County Electric Company Buys Plant.—The holdings of the Jasonville (Ind.) Water & Light Company, which company operated power plants in Jasonville, Hymera and Coalmont, Ind., have been purchased by the Sullivan County Electric Company, Clinton, Ind. The latter company furnishes power to Sullivan, Shelburne and Farmersburg.

Cincinnati Electric Club Discusses Subway.—At a meeting held January 31, of the Electric Club of Cincinnati, of which Thomas J. Ryan is president, questions concerning the traffic situation in Cincinnati were discussed by E. W. Edwards, chairman of the Rapid Transit Commission; Walter Draper, president of the Cincinnati Traction Company, and Mayor Puchta.

Quad City Builders' Exchange Hold Banquet.—Three hundred contractors from Davenport, Iowa, Rock Island, Moline and East Moline, Ill., attended the first annual banquet of the Quad City Builders' Exchange, at Rock Island, January 12. H. L. Lewman, president of the National Association of Builders' Exchanges, was the principal speaker. Electrical contractors of the four cities form one department of the Quad City Exchange.

American Association for the Advancement of Science.—The next meeting will be held in New York City during Christmas week, 1916. The 1917 meeting will probably be held in Pittsburgh. At the recent meeting at Columbus, Charles R. Van Hise, of the University of Wisconsin, was elected president; H. A. Burnstead, of Yale University, vice-president for section B, physics; and E. L. Corthell, of Brown University, vice-president for section D, engineering. R. A. Millikan was elected president of the American Physical Society.

Bill to Facilitate Public Ownership of Utilities.—A bill has been filed with the clerk of the Massachusetts House of Representatives which provides that any railroad, railway, system of telephone or telegraph, lighting or heating plant may be purchased by the state or any municipality, on petition of five per cent of the registered voters for a referendum on such purchase.

Leeds, England, Increases Use of Electric Heaters.—The Leeds electric lighting department reports an increase of 71 per cent in the output of electric energy for electric heating during the past six months. Improved appliances and the low price of energy are responsible for the large increase.

Wisconsin Contractors to Hold Summer Meeting.—At the annual meeting of the Eelctrical Contractors' Association of Wisconsin recently held in Milwaukee it was decided to convene at Oshkosh early in August. As a social feature of the meeting an interesting trip is being planned for members and their wives. The itinerary of the trip will be: Special steamer to Fremont and Gills Landing; by rail to Chain of Lakes; Waupaca for a day; by rail to Gills Landing, to Winneconne and back to Oshkosh.

Election of Officers by New Jersey Contractors.—At the annual meeting of the Association of Electrical Contractors of New Jersey, at Trenton, January 17, the following officers were elected for the ensuing year: President, E. P. Strang, Camden; vice-president, Charles R. Newman, Passaic; treasurer, Paul H. Jaohnig, Newark; secretary, ewell Van Dyke, Asbury Park. The following directors were appointed: Carl F. Adams, Trenton; Richard P. Ward, Dover; Charles R. Newman, Passaic; Benjamin F. Sprague, Long Branch, and H. C. Heidrich, Newark.

Jovian Congress to Meet in Detroit, February 16.—Fourteenth Jupiter, Thomas A. Wynne, vice-president and general manager of the Indianapolis Light & Heat Company, has called a meeting of the Fourteenth Jovian Congress at Detroit, February 16, coincident with the meeting of the Jobbers' Association. A number of very important policies affecting the future work of the Jovian Order with particular application to its relations with other electrical organizations will be discussed in detail and decided upon for the guidance of the Order during the year.

Additional Plants Proposed for Connecticut River.—Plans for an extensive development of the upper Connecticut River are being worked out by the Connecticut River Transmission Company and Stone & Webster, Boston, which will involve an expenditure of several million dollars. The hydraulic works include the construction of three dams, 160, 100 and 80 feet in height, respectively, and the raising of the lower Connecticut Lake about 17 feet, to provide increased storage facilities. The first and highest dam will span a gorge at Monroe, N. H., while the second dam will be constructed at Waterford, and the third near North Littleton.

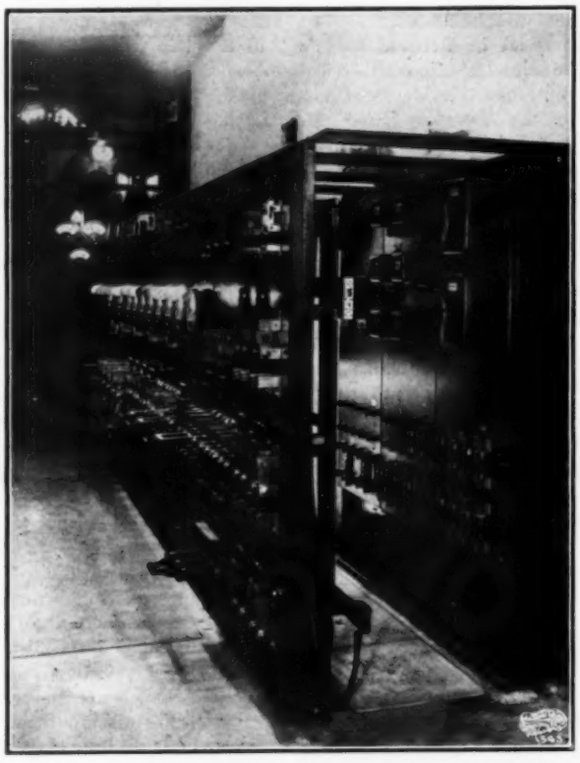
Large Aluminum Plant One of Norway's Newest Projects.—An extensive aluminum smelter is being organized at Höyanfjord, Norway, where there is a waterfall which may furnish 60,000 horsepower. It is proposed to develop 20,000 horsepower at once, to provide for the production of 4,000 tons of aluminum per year. The capital stock of the company is fixed at $3,350,000, of which $2,680,000 is subscribed. The banks of Christianja and Bergen have declared a willingness to underwrite a loan of $1,000,000 for the company. A number of bauxite beds have been secured in southern France, where the ore will be worked into oxides and shipped in this concentrated form to Norway for the final conversion into metal by electrical furnaces.

Electrical Features of a Modern Hotel

Construction Details and Electrical Equipment of the New Hotel Vancouver Erected in Vancouver, B. C., Without Affecting Operation of Old Building Which It Replaced

The rapid growth in population and business in Vancouver, the metropolis of British Columbia, in recent years has created a big demand for hotel accommodations. This demand has been met by the construction of a great number of fine hostelries. Prominent in this new development stands the Hotel Vancouver, which, on account of its location at the junction of the transcontinental railroad and Oriental and Pacific Coast steamship lines, under the control of the Canadian Pacific Railway Company, occupies a position of vital importance in the chain of hotels owned and operated by this company in the Dominion.

Characteristic with its policy to make ample provision to meet the demands of progress throughout its entire system, the Canadian Pacific Railway Company in 1912 began the construction of a new and capacious building on the site of the old hotel. It is most advantageously located on the brow of a hill overlooking the harbor. This location is further enhanced on account of the wonderful panoramic view of the city, the various bodies of water, the hills and snowcapped mountains that are within vision from this point.



Main Switchboard in Hotel Vancouver Showing Fuses.

The original hotel building was constructed in the form of a letter "L" and in a separate structure at the rear was located the power plant and laundry. From the beginning the exhaust steam from the various units in the power plant was the chief factor in the heating of the hotel. It was also used for drying purposes in the laundry.

As the pace in the growth of the city warranted new sections were added to this structure and the power plant was correspondingly increased. To provide accommodations which would otherwise be curtailed during the construction of the new hotel, a large apartment building was erected in the form of a letter "L" on one of the rear corners of the hotel site. The business of the hotel was continued throughout the entire construction period. The sections were razed one at a time as the work of construction progressed until at the present time a magnificent structure occupies the entire site.

The first work to be undertaken was the erection of a new power plant and laundry building. A seven-story structure of reinforced concrete was erected at the rear of the apartment building.

The engine room was laid out to take advantage of space not otherwise usable and occupies the areaway under the lane on the hotel side of the power plant and extends at right angle to the rear of the hotel.

The original plans of the hotel were drawn up with a view of installing hydraulic elevators throughout, and elevators of that character were installed in the apartment building and power plant when they were erected.

The source of supply for all other power was to be derived from a 110-volt, direct-current, two-wire system. With the exception of one generating unit the equipment in this power plant was new and consisted of the following: Three 400-horsepower water-tube boilers, all necessary boiler auxiliaries; two 175-kilowatt, 110-volt generators, direct-connected to vertical compound engines, one 75-kilowatt, 110-volt generator, direct-connected to a simple crank engine (this unit had been in service in the old plant for 10 years), one five-panel switchboard, consisting of three generator and two feeder panels; one horizontal duplex pump for house service, and two 25-ton refrigerating machines and condensers.

This plant was put in operation early in the year 1913. Since that time conditions have arisen which warranted the abandonment of the installation of hydraulic apparatus and necessitated the adoption of the electric drive for the elevators in the new hotel.

As none of the power-driven appliances throughout the hotel had been contracted for up to this time, and as the electric wiring installation throughout the hotel building had but reached its preliminary stage, a complete revision of the entire power and lighting equipment was made with a view of establishing the plant on the most economical basis possible, consistent with the changed conditions.

After due and careful consideration of all the problems involved, it was decided to convert the plant over to the 110-220-volt, three-wire system for lighting, all motors in operation at that time and those on the new schedule of one horsepower in size or less to be wound for 110 volts and the remainder to be wound for 220 volts. While it is a recognized fact that in the majority of three-wire installations, isolated two-wire, 110-volt block loads are apt to produce unsatisfactory balance conditions of the system, it was possible at this plant, at a small expense, to rearrange the existing two-wire feeders so as to maintain a satisfactory balanced condition.

Plant Rebuilt without Interruption.

To revise the plant to meet all the new conditions presented a problem that was complicated in the extreme inasmuch as it necessitated a considerable rearrangement of apparatus and a complete change of feeder distribution. Provision for every possible emergency was made and the work conducted without interruption in the operation of the existing plant.

Briefly, the new arrangement included three 100-kilo-

watt, 110-220-volt turbogenerators, and a new eight-panel switchboard. The 75-kilowatt generator was removed and one refrigerating machine and the two large pumps were moved to other locations so as to make room for the turbogenerators. A new switchboard consisting of five generator and three feeder panels replaced the old board and was located on the same foundation.

The engine room was laid out in the form of a letter "L," the 175-kilowatt units occupying the base, the switchboard in the corner and the other apparatus beyond in the following order: Three turbogenerators, two refrigerating machines and condensers, vertical pump and horizontal pump. The boilers are located below the base of the "L."

The boiler plant comprises three 400-horsepower water-tube boilers, each being built up of 14 sections of 13 four-inch tubes, 18 feet long. These boilers are designed for a working pressure of 190 pounds. Each boiler is equipped with forged-steel superheaters, designed to give 75 degree Fahrenheit superheat at the boiler nozzle. Each boiler is equipped with patent fuel-oil furnaces.

The burner control valves are located at the boiler front, the pipes conducting the steam for atomization and the oil from the control valves to the burner tips passing under the furnace floor through that part of the setting commonly known as the ashpit.

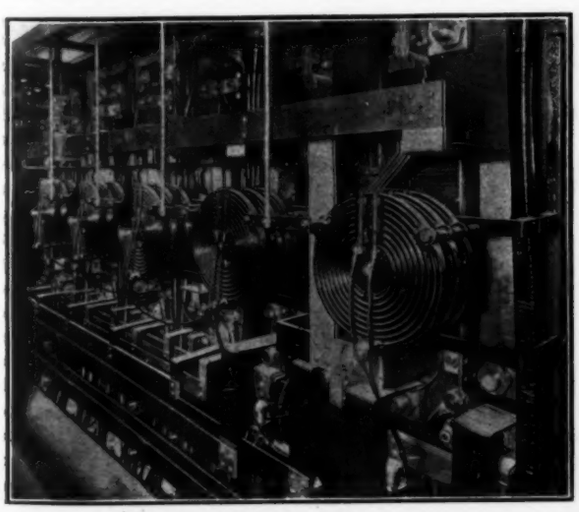
The boilers are also set with extra high furnaces so as to permit the most economical combustion of coal on chain grate stokers should the relative prices of coal and oil make it desirable to use coal fuel. Provision is made throughout the boiler room for the easy handling of coal and ashes by labor-saving devices, conveyors and hoppers.

In connection with the burning of oil fuel as is now installed there is provided an oil-pumping system of ample capacity for the operation of 1,400 horsepower of boilers. This set consists of two special duplex oil pumps mounted on a cast tray over a special condenser type of heater, thus making a compact self-contained pumping system.

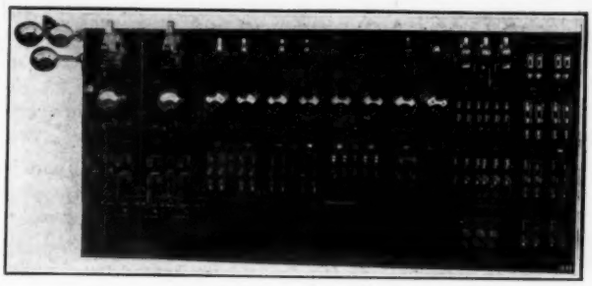
The feed water is supplied the boilers by two boiler-feed pumps. These pumps handle the returns from the heating system and make up water which is heated by a 1,000-horsepower Cochrane feed-water heater. The return from the heating system is pumped to the feed-water heater by two Burnham low-duty vacuum pumps. A motor-driven submerged type of centrifugal sump pump, located at one side of the boiler room, drains the ash tunnel and low points of the boiler room floor.

Electrical Equipment.

There are 175-kilowatt, 110-volt, direct-current compound-wound commutating-pole type generators, which are direct-connected to vertical compound engines running at 400 revolutions per minute. These generators are so connected that they may be operated in series on a three-wire system or independently on an emergency 110-volt bus, the functions of which are fully described later.



Rear of Switchboard, Hotel Vancouver.



Main Switchboard Showing Arrangement of Instruments.

The new electrical equipment consists of three 100-kilowatt, 110-220-volt, three-wire turbogenerators, operated at a speed of 3,600 revolutions per minute. These generators are compound-wound, commutating-pole, each having two series fields on opposite sides of the armature and necessitating two equalizer connections for parallel operation. For deriving the neutral connection, each generator is provided with a compensator located close to the generators. These turbines are of the Curtis type and are equipped with all of the latest improved features.

As the various buildings, including the opera house block, which is also served with light, heat and power, are heated by the exhaust steam from the combined units, the engines and turbines are at present operated non-condensing. However, provision has been made to equip the turbines with a condenser so that they may be operated condensing during such periods as the amount of exhaust steam is in excess of that required for heating.

The refrigerating plant consists of two 25-ton ammonia machines. The compressor cylinder is arranged in tandem with the steam cylinder. The condensers and brine coolers are of the double-pipe type.

Brine circulation is used throughout the entire system of refrigeration, while direct expansion is used in the ice-making tank which has a capacity of 5 tons per 24 hours. The brine circulation system is very complete, including refrigerators on each floor.

The switchboard consists of eight panels of uniform size, 66 by 24 inches, with sub-panels 24 by 24 inches, or a total dimension of 16 feet by 7.5 feet. The material used is the best quality of slate, two inches in thickness and painted with Egyptian lacquer so as to present a lasting dull-black finish which harmonizes perfectly with the polished copper appliances mounted thereon. The board rests on a six-inch channel iron base partly imbedded in the cement floor and is supported by a two-inch angle-iron frame and brace from the wall by material of light character.

Switchboard Wiring.

The board was designed with a view of locating the instruments and switches in the most natural position for the convenience of the operator and in the accompanying illustrations it will be noted that the instruments are on a level with the eye and the switches are at the proper height for the average person.

Beginning at the left, the first five are generator panels, being connected in rotation according to their location. Following these are the panels for 220-volt power, three-wire lighting, two-wire lighting and 110-volt power. The last panel on the right provides connection for the old two-wire system and double-throw switches were used to per-

mit the inter-switching of feeders in the event that any undue unbalance on the system should arise.

The circuit-breakers on all generators are connected between the generator and main switch and those on the turbogenerators are actuated only by the armature current.

The main or three-wire busbar is connected to all panels. The main equalizer bus is connected to all generator panels. The auxiliary power bus is connected to the turbogenerator panels and the power panel. Auxiliary equalizer bus provides a 110-volt connection between the 175-kilowatt generators and panels No. 7 and No. 8 and would be used only in the event that one of the 175-kilowatt generators would be out of commission during peak-load periods. The auxiliary power is provided in order to make possible the isolation of the elevator and heavy 220-volt power load during such time when the fluctuating condition of this load might disrupt the voltage regulation of the system. All busbars are supported by substantial brackets and hangers.

The generator rheostats are mounted on an angle iron frame firmly bracketed to the frame work of the switchboard.

In back of the main board is placed a fuse and meter board, consisting of three panels of 1.5-inch slate identical in size with the switchboard panels. These are in the same alinement with and 36 inches to the rear of panels No. 6, No. 7 and No. 8. The rear of this board is inclosed by a steel cabinet 10 inches deep and is provided with doors for each panel. On this board is mounted the fuses and meters for the various feeders. The load of the system has been so distributed that no feeder has a connected load of more than 400 amperes except the 220-volt feeders which are protected with circuit-breakers. Instead of metering the output of each generator as had been done previously, each outgoing feeder was provided with a watt-hour meter so that the load distribution may be accurately recorded.

On account of the limited amount of space permissible between the switchboard and the wall, and to accommodate the large number of cables that lead to and from the switchboard, a cable pit, 30 inches wide and 36 inches deep, was built the entire length and at the rear of the board and this was racked off for cable supports. All cables are run underground in conduit. These end in this pit and the cables are carried from the conduit ends to their terminals on porcelain cleats. The pit is floored over with two-inch cement panels, 24 by 24 inches, supported by an angle-iron frame. The intervening space between the floor and switchboard foundation is left open to permit the passage of cables leading to and from the board. Openings are provided in the rear pit wall which extend to the rear of the meter board for the passage of cables in connection with that board. Notwithstanding the fact that but a 30-inch space was permissible behind the switchboard and that the busbars and rheostats would occupy a considerable amount of that space, all details were worked out in such manner so as to leave an ample and unobstructed space, which permits any part of the board being easily accessible to the operator. As a precautionary measure against trouble at the terminal boards on the generators which are in an unprotected location, they were inclosed in sheet-steel boxes.

The main elevator feeders run direct from the switchboard to the distributing board located in the penthouse on the roof, 600 feet distant.

The 200-volt general power and the three-wire feeders run to a main distributing board, centrally located on the tunnel floor of the new hotel. This board is laid out in five sections, one for 220-volt power, and the other four for the three-wire distributing feeders that run to the various panel boards.

The elevators and dumb waiters consist of the following: three passenger elevators of the one-to-one traction type, having a speed of 500 feet per minute and operated by 35-horsepower motors running at 63 revolutions per minute; one service elevator of the worm-gear traction type, operated by a 40-horsepower motor running at 800 revolutions per minute; one baggage elevator same as last mentioned; and one kitchen service elevator same as last mentioned, but operated by a 20-horsepower motor. There will be eleven dumb waiters distributed throughout the hotel, driven by motors varying in size from 3 to 10 horsepower.

An elaborate system of ventilation has been installed, which continuously supplies pure air tempered to suit the prevailing atmospheric conditions and simultaneously removes impure and obnoxious odors.

President Snyder, of Iron and Steel Engineers, Sees Great Opportunities for Electrification of Mills.

The important work done by the Association of Iron and Steel Electrical Engineers in the application of electricity to the iron and steel and allied industries was touched upon in the address made by W. T. Snyder, the newly elected president of the Association, at its first monthly meeting of the year, held in Pittsburgh, Pa., January 15, 1916.

Mr. Snyder, who is superintendent of the electrical department of the National Tube Company at McKeesport, is well fitted for the presidency of the Association, having spent many years in the study and promotion of electrical apparatus in steel-mill industries and his program and policies, as outlined at the meeting, if carried out, will undoubtedly increase the usefulness and prestige of the Association in the industrial field.

The magnitude of the iron and steel industry and the extent to which it was represented in the Association was illustrated by showing the number and location of all the blast furnaces in the United States, together with the number and the location of members of the Association, showing that the Association was more largely represented in the industrial centers in which local meetings of the members are held.

Much of the present highly advanced state of the iron and steel industry is due to the application of electricity to the various processes. Present achievements in electrical application is largely due to the pioneer and subsequent development work of the members of this Association.

Promotion of local activity of members in the different industrial centers was strongly urged.

The Association should adapt itself to the modern trend, it should not be content with past achievements. Much has been accomplished in the past, but it is small in comparison to what remains to be done.

It was President Snyder's impression that this Association should begin to so shape itself that it can adapt itself to conditions that will be brought about by future developments, the trend of which is toward the consolidation of small units into larger organizations and the universal applications of electrical energy to the exclusion of less useful and efficient forms. It should look into the future a few years when use will be made of the vast amount of water power now going to waste in our country; when the waterfalls of the Rocky Mountains will help to roll steel in the eastern states at the same time that it is helping to grind wheat in Minnesota; when there will be universal application of electrical energy even for domestic purposes; when the day that Dr. Steinmetz predicts will come and our country is covered with a network of transmission lines; when the electrical engineer will be the man behind the gun.

Compelling Utilities to Serve the Public

Two Recent Court Decisions Affecting Electric Central Stations Establish Important Precedents in Utility Operation

By William E. Mooney

The Marianna Electric Company was a public service corporation engaged in the business of furnishing electricity for light and power to the citizens of the city of Marianna, Ark. The company had been operating for a number of years a 133-cycle system and the users of the electric energy had, of course, installed motors and machines for this frequency. The company later found it advisable, in the interest of efficiency, to change to a 60-cycle system. A number of the users of electric current complained at this change, stating that they would have to change their motors and machines or go to great expense in readjusting or repairing them to meet the new system.

The rule of law applicable to this case is one of reason. The electric company had the right to make the change in its system and method of operation as, in the exercise of an honest judgment on the part of the managing officials, it was necessary to a proper service to the public. Thus it may be noted that the company was sole judge of the matter except that it could not make a change needlessly or capriciously.

The users who complained adopted a novel plan, for, since their motors and equipment was rendered useless, it was held that the electric company should bear the expense of furnishing them with either new equipment to meet the requirements of the new system or to repair and readjust the old equipment. The Court held that if this theory was good that the company, in order to meet this expense would have to consider it as an item in the fixing of its rates for service, and that ultimately the expense would fall upon all the consumers of electricity, and would be an expense borne by the general public. (Hunt vs. Marianna Electric Company, 170 S. W. 96.)

The rule enunciated in the foregoing case is naturally but the necessary result of following a few older illustrations. Waseca, Minnesota, had a problem somewhat similar a few years ago. The city owned and operated an electric plant which had been installed at public expense. One of the merchants of the city, W. J. Armstrong Company, was in the business of operating a bottling works, and required electric power. The Armstrong Company installed two three-phase motors with the intention of operating them by electric current to be furnished by the city. After these were installed, application was duly made to furnish electric current and power. The city refused to furnish the current unless the Armstrong Company would install two transformers, which, if purchased new, would cost about $80. In this case the Court went about the matter in a peculiar manner. It first decided that the Armstrong Company was entitled to electric power service and said that inasmuch as the Armstrong Company found it necessary or advantageous to install three-phase motors "it was the duty of the city to furnish such power and to install such appliances as were necessary." So far the decision would appear to be entirely against the electric company. But then the court went on and held that if "a particular consumer desires service which the city can supply only by the installation of transformers at an expense which is substantial, and which is not entailed in furnishing power to others, the consumer who occasions such special expense should bear the burden thereof. (State, etc. vs. City of Waseca, 122 Minn. 348.)

Another recent case, Gainesville vs. Gainesville Gas & Electric Power Company (62 So. 919), seems to go farther than any other reported case in requiring a public service company to serve even those with whom it has no specific contract. It is common knowledge that there is rarely more than one public service company serving one community; the nature of the service requiring almost a monopoly in the territory. The franchise they receive is in effect nothing more than a contract between the authorized representatives of the public and themselves. In the case above noted the city of Gainesville, Fla., consented to the construction of an electric lighting and power plant, and the company thereupon entered into the business of the manufacture and sale of electricity for illuminating and power purposes. Later on, for some reason not appearing, the company determined to close down and discontinue the public service business. This move was undoubtedly taken because of harsh and arbitrary ordinances passed by the city of Gainesville. A suit was filed to restrain the company from discontinuing its public service business, and the court held that a corporation engaged in furnishing electricity to a municipality or its inhabitants and using public streets or exercising other franchises or privileges in doing so, is thereby performing services of a public nature, and such a corporation is subject to lawful governmental regulations to enforce its duties to the public it undertakes to serve. As the company had received and accepted from the State a charter authorizing it to engage in the business of manufacturing, generating and selling electric current for lighting and power purposes, the company thereby assumed the duty imposed by implication of law to render a reasonably adequate service during the time its rights and duty may lawfully continue, and such duty may be enforced where no adequate excuse is shown.

The foregoing rules are based upon the general law governing public service companies. These rules were first developed in relation to gas companies. There are a number of judicial decisions requiring gas companies to not deprive themselves during their franchise period of their facilities for doing business without consent of the public or their authorized representatives.

Radio Phone Experiments Prove Successful in Winter Maneuvers.

Important experiments in radio telephony are being conducted by the Atlantic fleet during its winter maneuvers off Cuba. These are the result of the successful outcome of experiments carried on for the past year by the American Telephone & Telegraph Company and the Western Electric Company in co-operation with radio stations under the jurisdiction of the Navy Department by which long distance wireless telephony has been made possible. The experiments are being carried on in an effort to ascertain the military applicability of the wireless telephone to the work, tactics and strategy of a great battleship fleet.

Radio-telephone transmitters have been installed on the *Wyoming*, Admiral Fletcher's flagship, and on the *Texas*. These transmitters are being used in sending messages to the other units of the fleet, which, while not equipped with the telephone transmitters, are able to receive the messages by means of radio-telegraphic sets.

Central-Station Costs in Massachusetts

That actual manufacturing costs in the production of electrical energy by well equipped, modern steam generating stations, operating under favorable conditions, are about 0.8 to 0.9 cent a kilowatt-hour, is indicated by the returns of leading electric lighting companies in Massachusetts, to the Gas and Electric Light Commission of that state. In certain instances the manufacturing costs may be as low as 0.6 cent a kilowatt-hour, and they run well above one cent in many central stations, but the average of the larger and better plants may safely be reckoned at the figures cited. These, of course, are the costs entirely apart from fixed charges and the expenses of management, distribution, etc.

The United Electric Light Company, Springfield, Mass., the Edison Electric Illuminating Company of Brockton, and the New Bedford Gas & Edison Light Company, New Bedford, all operate modern turbine stations. These companies' manufacturing costs per kilowatt-hour are, respectively, 0.911, 0.852 and 0.867 cent.

Boston Edison Company.

The principal station of the Edison Electric Illuminating Company is at East Bridgeport, Mass., and has the following equipment:

	Horsepower
4 Babcock & Wilcox boilers, Taylor stokers, at 525 equals	2,100
2 Edgemoor boilers, Taylor stokers, at 600 equals	1,200
Total	3,300
	Kilowatts
2 Curtis turbos, at 2,000 equals	4,000
1 General Electric turbine	5,000
Total	9,000

The source of condenser and boiler feed supply is the Matfield River. Coal is brought by rail, the average cost being $4.778; 15,625 tons were used during the year. Kilowatt-hours of electricity generated, 16,285,691. The manufacturing expenses were as follows:

	Total Cost	Cost per Kilowatt-hour Cents
Fuel, deposited at works	$ 74,660.27	0.460
Oil, waste and packing	745.69	0.004
Water	3,083.41	0.019
Wages at station (26 employees)	29,221.39	0.180
Station tools and appliances	3,716.77	0.028
Station structure repairs	12,875.98	0.080
Steam plant repairs	11,291.80	0.070
Electric plant repairs	3,181.41	0.019
Totals	$138,776.72	0.852

New Bedford Company.

The generating station of the New Bedford company is located on the water front and enjoys the advantage of water-borne coal. Its equipment now in service consists of:

	Horsepower
7 Babcock & Wilcox hand-fired boilers at 508 equals	1,016
4 Babcock & Wilcox hand-fired boilers, at 600 equals	2,400
Total	3,416
	Kilowatts
2 General Electric turbines, at 4,000 kilowatts equals	8,000
1 Westinghouse jet condenser turbine	1,000
1 General Electric jet condenser turbine	300
1 General Electric non-condenser turbine	100
Total	9,400

Sea water is used for condenser supply, and the boiler feed is from the city mains. Coal used or unaccounted for aggregated 10,934 tons and cost an average of $3.60 per ton. Kilowatt-hours generated, 8,356,375. The manufacturing expenses were as follows:

	Total Cost	Cost per Kilowatt-hour Cents
Fuel, deposited at works	$ 39,456.84	0.460
Oil, waste and packing	249.80	0.003
Water	3,174.91	0.038
Wages at station, (23 employees)	25,864.76	0.300
Station tools and appliances	2,067.28	0.024
Station structure repairs	898.81	0.011
Steam plant repairs	2,225.95	0.026
Electric plant repairs	437.08	0.005
Totals	$ 74,375.43	0.867

Holyoke Water Power Company.

Total manufacturing and distributing costs of electricity generated by the Holyoke (Mass.) Water Power Company, operating a hydroelectric and steam auxiliary plant on the Connecticut River, are given in returns for 1915 to the Massachusetts Gas and Electric Light Commission, as follows:

Coal for auxiliary plan	$ 9,921.47
Rental of waterpower	13,858.07
Oil, waste and packing	105.44
Water for boilers	75.26
Wages at station (10 employees)	9,176.91
Station tools and appliances	55.00
Hydraulic plant repairs	38.85
Steam plant repairs	275.86
Electric plant repairs	42.11
	$33,548.97
Distribution expenses (to 7 customers)	$ 341.79
Office expenses and management	3,942.45
Taxes	1,974.48
Miscellaneous expenses	1,467.37
	$ 7,726.09
Total operating expenses	$41,275.06
Kilowatt-hours generated, hydroelectric plan	2,094,180
Kilowatt-hours generated, steam auxiliary	1,634,890
	3,729,070
Manufacturing costs per kilowatt-hour	$0.009
Total cost per kilowatt-hour	0.011
Manufacturing cost, exclusive of water rental, per kilowatt-hour	$0.00525

Sales of electric power aggregated $47,451.63, leaving a balance to profit and loss account of $6,176.57.

The company operates its steam plant, which is installed under the same roof with the hydroelectric generating equipment, only in times of extremely high or low water.

Turners Falls Power Company.

Returns made by the Turners Falls Power & Electric Company to the Gas and Electric Light Commission show the following manufacturing costs for 7,265,900 kilowatt-hours of energy generated at its hydroelectric plant during 1915:

Wages at station	$4,645.87
Oil, waste and packing	338.78
Station tools and appliances	87.22
Station repairs	28.37
Hydraulic plant repairs	852.76
Electric plant repairs	279.54
Total	$6,232.54

United Electric Light Company.

The United Electric Light Company's steam plant, at State Street, Springfield, has the following equipment:

	Horsepower
4 Porcupine boilers, with Murphy stokers, at 400 equals	1,600
6 Porcupine boilers, with Murphy stokers, at 400 equals	2,400
6 Williamson boilers, with Murphy stokers, at 400 equals	2,400
5 Williamson boilers, with Murphy stokers, at 400 equals	2,000
3 Hazelton boilers, with Murphy stokers, at 300 equals	900
Total	9,300
	Kilowatts
1 Westinghouse Parsons turbine, Le Blanc condenser	4,500
1 Westinghouse Parsons turbine, Le Blanc condenser	3,600
1 Westinghouse Parsons turbine, Le Blanc condenser	2,500
3 Westinghouse Parsons turbines, Deane condenser, at 1,000 equals	3,000
Total	13,600

The source of the condenser and boiler feed supply is the Connecticut River. Coal is procured by rail, at a cost, delivered, of $4.27; 31,954 tons were used during the year. The following were the manufacturing expenses (total kilowatt-hours generated, 24,093,070):

	Total Cost	Cost per Kilowatt-hour Cents
Coal, deposited at works	$136,686.24	0.570
Oil and waste	1,178.83	0.005
Water	898.10	0.004
Wages at station (60 employees)	38,679.53	0.160
Station tools and appliances	1,833.38	0.008
Station structure repairs	12,450.85	0.050
Steam plant repairs	19,776.92	0.081
Electric plant repairs	8,028.69	0.033
Totals	$219,533.54	0.911

COMMERCIAL PRACTICE

New Business Methods, Policies, Rates and Kindred Central-Station Matters for the Man Engaged in Selling Electricity

National House-Wiring Campaign Projected.

Plans have been formulated by the Society for Electrical Development for a nation-wide house-wiring campaign to be conducted from March 25 to April 25. The object of the campaign is to co-ordinate various individual house-wiring campaigns conducted each year by electrical interests into a general comprehensive effort. The fact that not eight per cent of the homes in this country are wired for electricity and that not 20 per cent of the houses on the existing lines of the central stations have electric service strengthens the belief that if a nation-wide campaign was inaugurated to wire more homes with all interests co-operating, greater results could be obtained than by a series of disconnected campaigns.

Considerable assistance will be offered in the way of advertising copy for central stations and contractors as well as ideas for window displays and other literature designed to be helpful. A booklet entitled "Successful House Wiring Plans," is to be prepared by the Society and 25,000 copies will be mailed shortly to those interested. The booklet will contain suggestions for conducting house-wiring campaigns and how various central stations and contractors have effectively worked them out.

A committee comprising P. L. Thomson, T. J. McManis, Elliott Reid, N. H. Boynton, Joseph F. Becker, George Weiderman, H. W. Alexander, A. J. Edgell, J. T. Kelly and Hill Griffith has been appointed to supervise the campaign.

Reading Gas and Electric Meters Simultaneously Effects a Saving of $200 Per Month.

On January 1, 1915, the New Orleans Railway & Light Company adopted the plan of having one meter reader read both gas and electric meters in a customer's premises on the same trip. Since this plan has been in effect a minimum saving of $200 per month has been effected, as the salary of one meter reader is saved as well as a bill distributor, and considerable economy has been effected in printing, stationery, stamps, etc., due to using one billhead for combined gas and electric service.

The items comprising the saving are made up as follows:

Two meter readers at $60	$120.00
One bill distributor	60.00
Miscellaneous (including printing, stationery, stamps, etc.)	20.00
Total	$200.00

The company states that one of the main purposes in combining these bills was to satisfy its customers, as numerous complaints were registered relative to receiving a bill for electric service on one day and the bill for gas service another day with discount periods that did not correspond. This complaint has now been completely obviated and in addition it has relieved the congestion at the teller's window and enabled collections to be handled very efficiently.

The meter readers read on an average of 225 meters a day, including those where service is to be discontinued. The company has 19,749 electric meters and 26,309 gas meters installed.

Fig. 1 shows the type of bill used where a customer has one electric meter and one gas meter installed. Fig. 2 shows the bill used when customer has more than one gas and electric meter and Fig. 3 shows the style of bill used for billing customers using service under the wholesale schedule.

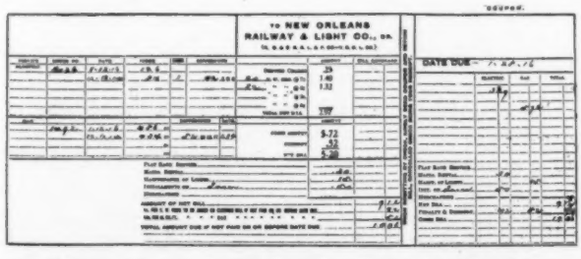


Fig. 1.—Combined Gas and Electric Bill Used by New Orleans Company.

Fig. 2.—Bill Used Where There Is More Than One Gas and Electric Meter.

"Electricity Our Best Servant."

Twelve prizes were distributed January 8 by the Rutland (Vt.) Railway, Light & Power Company, to students in schools in the company's territory, six prizes being awarded to pupils in Rutland and six to pupils in the outlying district, for essays on "Why Is Electricity Our Best Servant?"

The first prize, of $10, for the Rutland district was awarded to Anna F. Callahan, aged 18, a pupil in Mt. St. Joseph's Academy, and was as follows:

"The word servant, as generally understood, is applied to that which labors for, or serves another. In private or public life, the servant most highly prized is the one who proves himself most useful, reliable, faithful and trustworthy; who studies, provides and looks after the household's wants, interests, comforts and pleasures.

"A human servant possessing these attributes would indeed be prized; but does not electricity possess all these characteristic traits of a perfect servant? Proceeding from

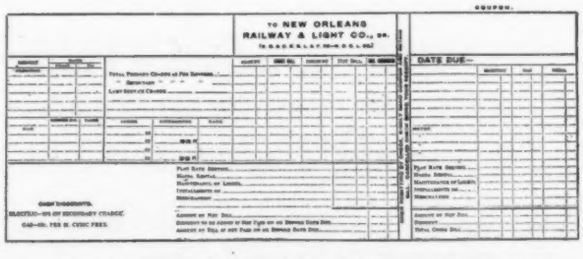


Fig. 3.—Billhead Used Where Customer Is Under Wholesale Schedule.

the general to the specific, one has but to look about him to see in the various uses of electricity these attributes of the perfect servant in full operation. Its constant use for lighting, heating and motive power in the home is an assurance that electricity is useful, reliable, faithful and trustworthy; the thousands and one inventions which reduce domestic labor so materially and which are dependent on electric power for operation, evidence this. Else, why the rapidly increasing call for electric grills, urns, toasters, irons, etc.? Could there be a stronger demonstration of the assertion that electricity is the one desirable servant to look after the wants, interests, comforts and pleasures of the family home?

"Electricity in the service of the national family bears likewise the same characteristics of the thoroughly 'tired and not found wanting' helper. The constant whirr of machinery in the nation's mills, shops and factories, the hum of the trolley cars, the metallic click of the cable messages, the never ceasing ring of the telephone bells, the 'S. O. S.' calls of distressed ships at sea, the X-Ray photographers, all attest how this very efficient servant ministers to the nation in its every phase, whether industrially, socially, commercially or scientifically.

"Viewing the untold valuable services rendered by electricity today, and contrasting its position with that of hardly a century ago, when 'it was known only as a flash which man could neither hinder nor make,' one's amazement is unbounded. And yet Edison, to whose magical genius this power responds, as did Aladdin's lamp to the burnishing, declares that modern use is putting it only to its minimum test, that we are only beginning to know what this wonderful servant can do for us.

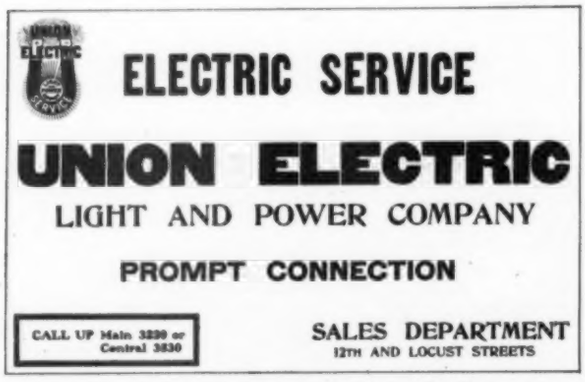
"Electricity, so universally helpful today, what will you be a century hence?"

Co-operating with Real Estate Agents Brings Results in St. Louis.

As a step to insure the greatest percentage of households to use electric service when moving into buildings wired for electricity, the Union Electric Light & Power Company, St. Louis, Mo., has taken every possible means to eliminate "red tape" in providing service. In furtherance of this idea, the company is co-operating with renting agencies so that new tenants are at once reminded of the possibilities of securing service without undue delay.

The accompanying illustration shows the back of a "for rent" sign, measuring 14 inches by 21 inches, which is printed by the central station and contains on the opposite side the customary announcement of the real estate agent. In addition to this, the company furnishes an attractive key card for use by real estate firms, which gives the name of the real estate agent, the monthly rent of the vacant house, number of rooms, etc., on one side and on the opposite side contains an announcement of the Union Electric Light & Power Company that electric service can be secured promptly by telephoning the contract department.

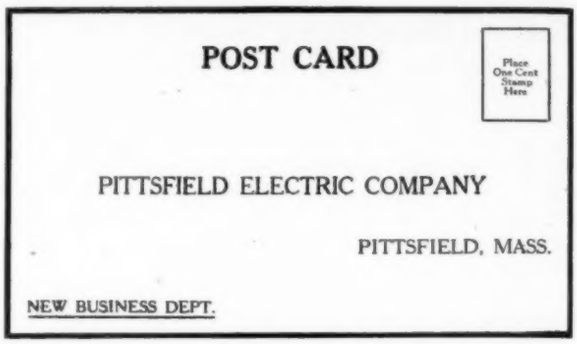
It is reported by F. D. Beardslee, sales manager of the company, that numerous requests for service are traced directly to the advertising which appears on the signs and key tags.



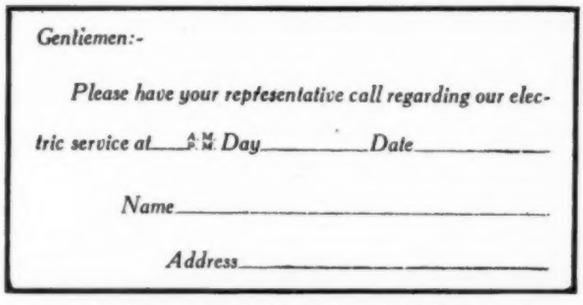
Reverse Side of a "For Rent" Sign Used in St. Louis.

Pittsfield Company Facilitates Renewals.

During the year 1915 the Pittsfield (Mass.) Electric Company secured 800 renewals from customers changing their place of residence. At least a portion of this business is attributed to a little tag which is hung on the front-hall fixture of every wired house when service is disconnected. The tag, as shown in the accompanying illustrations, has the address of the company printed on one side and on the opposite side space is left to indicate when a representative of the company can call to close a contract for service. These cards are perforated at the end so that they can easily be detached and used as a mailing card.



Face of Tag Hung on Fixtures in an Unoccupied House.



Back of Fixture Tag Which Is Used as Mailing Card.

Telephone Canvass for Business is Productive.

The value of the telephone in securing new business is forcibly brought out by a campaign conducted during January by the Pittsfield (Mass.) Electric Company. The "All Nite Lite" was featured in the campaign and the results are shown in the accompanying table.

Total calls made	312
Not interested	53
Balance	259
Houses not wired	154
Balance	105
Have Nite Lite	11
Sent on approval	8
Sold	2
Will call in office	15
Will call on telephone	29
Will consider	9
Send representative, wiring, etc.	16
Wired but not using	15
Total	105

It will be seen that of the 312 telephone calls made only 53 reported that they were not interested. The expense of this campaign is negligible when compared to the results that were secured.

Post Cards Used for Advertising House-Wiring Campaign.

In an effort to reduce the cost of direct advertising and at the same time to encourage responses from prospective customers, Robert Montgomery, commercial manager of the Louisville Gas & Electric Company, is working out a post-card advertising series, the set consisting of six large-sized cards. These, illustrated with special drawings and with text provided, will be mailed at intervals to the 7,000 householders living in unwired houses on the distributing lines of the company. Several interesting drawings, all of them such as to attract attention and with text to suggest wiring, are being made. Practically all of these prospects are now gas consumers and their credit ratings are thus assured. Heretofore the company has been using circular letters, inclosing stamped post cards, making each letter cost about five cents. The returns have not been thought sufficient to justify continuation of that plan. By the plan which Mr. Montgomery is now working out it will be possible to reach all these people, in probably as effective a way, six times instead of once, at a cost of between six and seven cents for the whole number of times.

Municipal Lighting Committee, N. E. L. A., Meets in Cleveland.

Active work on the report of the committee on Municipal and Highway Lighting, Lighting Sales Bureau, N. E. L. A., of which Thomas F. Kelly, Dayton Power & Light Company, is chairman, was commenced with a meeting of the committee in the office of N. H. Boynton at Nela Park, Cleveland, on January 31. Members of the committee present were : Thomas F. Kelly, chairman; R. C. Bach, Edison Electric Illuminating Company, Brooklyn; S. B. Cushing, Public Service Company of Northern Illinois, Chicago; Ward Harrison, National Lamp Works of General Electric Company, Cleveland; F. A. Ritchings, United Electric Light & Power Company, New York; H. A. Tinson, Edison Lamp Works of General Electric Company, Harrison, N. J.; N. H. Boynton, National Lamp Works of General Electric Company, Cleveland; and A. W. Young, Public Service Electric Company, Camden, N. J.

Written reports were received from committee members F. D. Shaffer, Public Service Company of Oklahoma, Chickasha, Oklahoma; S. H. Conkey, Minneapolis General Electric Company, Minneapolis; C. M. Masson, Southern California Edison Company, Los Angeles, Cal., and S. N. Clarkson, Union Electric Light & Power Company, St. Louis.

Plans were adopted for the preparation of a report on ways and means for the sale of lighting for all classes of municipal thoroughfares and roads under the jurisdiction of various political divisions as states, counties and townships. It is the intention of this committee, as expressed by Chairman Kelly, to make its report of as much practical value as possible to central stations seeking business having to do with the lighting of public thoroughfares of all classes. Another meeting of the committee will be held late in February.

Hull, Mass., Municipal Plant Sold.

The municipal generating station at Hull, Mass., was closed January 11 and the Weymouth Electric Light & Power Company began to furnish energy under a 10-year contract which it is said will reduce the annual appropriation about $7,000 and bring about a lower rate to private consumers. The distributing end of the municipal plant will be continued, with a corps of clerks having headquarters in the plant building.

Salary and Commission Best Basis for Paying Salesmen.

That it is necessary to pay central-station salesmen a commission on business secured in order to obtain the best results was the consensus of opinion of sales managers in attendance at the recent convention of the New-Business Committee of the Ohio Electric Light Association at Akron, O. After eight or ten years of experience, A. K. Young, new business manager of the Toledo Railways & Light Company, is convinced that the salary and commission plan is the most satisfactory. At present salesmen of this company are paid a salary of $50 per month plus a commission of 50 per cent of the profit on each appliance sold. This plan was adopted about one and one-half years ago and it has resulted in increased sales for the company, higher salaries for the salesmen and a much more desirable arrangement for all concerned.

A somewhat similar experience has been had by the Springfield (O.) Light, Heat & Power Company, J. E. North, commercial manager, reporting that after paying salesmen a straight salary for several years, it was decided that a salary and commission would serve to stimulate activity among the sales force and eliminate unproductive employees.

An experimental schedule was adopted, providing of a salary of $40 per month plus a commission of 10 per cent on electrical appliances except irons on which a commission of 50 cents each is paid. For house-wiring a commission of 25 cents per outlet is paid and 5 cents per outlet for electric signs. Power salesmen receive the same salary and a commission of 75 cents per horsepower installed. No commissions are paid until the company has received full payment for appliances. In the case of old houses, the commission is not paid until the customer has been connected.

Colorado Power Plant to Be Enlarged.

Announcement has been made that the Arkansas Valley Railway, Light & Power Company would at once begin extensions and improvements to its property at Canon City, Colo., that would cost $500,000. Sixty thousand dollars will be devoted to the enlargement of its generating and power plant and about $100,000 for its equipment with new machinery, including boilers, generators, transformers and super-heaters. Ten thousand horsepower will be added to the capacity of the plant, which now is 6,500 horsepower.

The remaining money to be invested will go into the improvement of the power transmission lines to the Cripple Creek district and to various coal camps supplied with electricity from the Canon City plant. The enlargement of the capacity of the plant is made necessary by the demand for greater economy in operations, the general reduction in the rates charged for electric power and to take care of new business in the mining camps reached by the company's lines.

Incubator Campaign in Maine.

Appropriately to the season, the Central Maine Power Company is featuring electric incubators for farmers' use in that territory. The merits of the "Lo-Glo" incubator are pointed out, with the assurance that it will hatch chicks free from germs and insects, and that from actual tests at the company's Waterville store it is found that the chicks grow faster than when hatched by the mother hen.

Another Massachusetts Municipal Plant Buys Its Electricity.

The Amesbury (Mass.) Electric Light Company has closed a contract with the Selectmen and Electric Light Commissioners of the town of Merrimac, Mass., to supply electricity for a term of 5 years, for street and commercial lighting.

POWER ENGINEERING

Problems Involving Motor Applications, Machine Characteristics, Power Sales Methods and Industrial Electric Heating

SELLING POWER TO A STRUCTURAL IRON PLANT.

A Resume of the Arguments Advanced by the Power Salesman That Were Later Substantiated by Marked Economies.

In negotiations with the Louisville (Ky.) Bridge & Iron Company previous to writing of the contract by which that company adopted central-station service, representatives of the Louisville Gas & Electric Company had a straightforward proposition to work out. The company was closed with last June, has been using central-station service since then at the rate of about $250 a month and in the files of the commercial department is a letter in which the company states that it is thoroughly satisfied with the service and would not go back to steam under any conditions.

The Louisville Bridge & Iron Company is one of the old manufacturing concerns of Louisville and has a long and honorable record. Incidentally the sales representative of the electric company or its predecessors have been striving to secure this business for several years. It was obvious that the time was shortly coming when improvements in the power plant would be imperative. The old equipment was showing wear; it was not as efficient as it should have been. The question was whether replacement should be in the form of new steam equipment, or whether the plant should be electrified. First of all the company obtained estimates necessary for replacement of equipment similar to that in use.

Then one of the engineers in the commercial department of the Louisville Gas & Electric Company obtained permission to show what his company could do. He made a careful study of the operations of the company. He found the boilers in one end of the plant and the engine, an old slide-valve proposition, at the other. Power was communicated to the various machines by means of line shafting, the main shaft extending the length of the factory, a stretch of about 100 yards. Among the other machines belted to this shaft was an old generator which the company used to generate energy for lighting and to operate a few small motors. A 20-horsepower motor and two 15-horsepower motors, direct current, were used on the large shears and on the traveling cranes in the yard. These were supplied by the central station.

After making various tests and the necessary and usual computations the engineer worked out the plan for electrification. His figures, including the changing over of the central-station motors already in use and the small ones taken care of by the isolated plant, called for a connected load of approximately 350 horsepower, with various alternations, changes in fixtures, etc., which would cost the bridge company approximately $8,500. The changes included throwing out the old steam-driven air-compressor for operating the hammers, to an electric compressor, throwing out of two big ventilating fans and replacing them with five smaller fans, besides changing over the old direct-current equipment on shears and cranes.

Comparing this with the cost of installing the steam equipment, the boilers alone to take the place of the antiquated and failing ones then in use, would cost the company $6,000. These would greatly increase the efficiency of the plant, admittedly, even with the old engine and the wastefulness of the long shaft. But they would have had to be accompanied with a new engine. If the company was to go further and install an isolated plant to generate its own electricity the cost would have mounted higher, going even as high as $10,000. Also there would be some salvage to reduce the cost of the electrical installation, while if steam were to be replaced the salvage would represent a very small item.

Saving in Overtime Operation.

So much for the initial cost of the competitive installations. This initial cost was a matter which could be presented advantageously from the angle of the central-station salesman. And it was. But this advantage was slight compared with the gain in efficiency which could be counted on with motor equipment. In the first place the wasted energy unavoidable through use of the long and heavy shafting and innumerable pulleys represented a big advantage for electric drive. If there was no occasion to use any machine in the mill other than the cold saw, for instance, the whole of the shaft had to turn. Now that saw is operated by a 10-horsepower motor, 1,150 revolutions per minute, geared to the saw.

Again there were the two large rotary fans, both belted to the center shaft. If one of the forges in the far end of the building was in operation, the whole equipment had to operate and power enough was demanded to clear the whole structure of the overheated air. Now fans of smaller capacity to which the motors of from 7.5 to 10 horsepower are belted do the work instead and only so much power is needed as is required to clear the air where the air needs clearing.

Much of the work done by the Louisville Bridge & Iron Company is contract work and the time element is a very important factor. It is, therefore, often necessary to work longer hours than normal in order to get a job out on specified time. There is frequently, for instance, boring work that will run throughout the night. Heretofore when this work has been necessary the company had to keep the steam plant in operation all night, and to keep the fireman and engineer on duty, as well as the crew handling the jobs. Under the present arrangement overtime of this kind would require operation of only a small portion of the equipment. Besides requiring no services of engineer, firemen, etc., the gain through elimination of wasted energy is an exceedingly big item.

An interesting feature in connection with this particular installation is that the promises of the power salesman came true immediately after the installation was completed. On one contract which the company took hold of there were 24 hours of straight boring. It was a rush job and meant that the machine had to be kept going a day and a night. Under the old dispensation this would have meant that the whole plant, virtually, be kept operating on a 24-hour trick. Under the new system the costs

were reduced to just the actual requirements of the job.

Throughout the whole plant there were arguments of this same character. Even the electrically driven tools used previously depended upon operation of boilers and engines to be available. When the plant shut down the generator upon which these smaller motors depended also was inoperative. Equipped on the old basis the plant could hardly turn a wheel unless the whole business was going, with the accompanying cost and waste.

In this plant there was not the frequently encountered question of what to do for heat and steam for other purposes. In the first place the plant is one exceedingly difficult to heat. It is a high-roofed shed, designed to let the excessive heat escape, rather than to conserve it. The air is always tempered by the forges in which metals worked are heated. In summer the fans hurry this overheated air out of the structure. The heating proposition, therefore, did not enter into the consideration.

Saving in Operating Costs.

Footing up the advantages of central-station electric drive, compared with steam power or isolated plant, showed such an overwhelming advantage on the side of the central-station proposition, that it was not necessary to go into elaborate detail. The estimates were sufficient. The first cost of the various types of equipment were virtually enough to determine the answer. Examination of the estimates of the operating costs were also favorable to the electric company contract.

An interesting feature of the requirements of the bridge company, which is worth considering, is that its peak comes when the load on the generating equipment of the electric company is comparatively light. It is this item which makes the bridge company a doubly valuable customer.

Involved also in the selling argument in this case is the matter of competition. Any manufacturer, of course, is always keen to reduce his operating costs and all other costs. Usually if he can be shown that the proposed installation will give him that kind of reduction he is ready to sign the contract. But if under the prevailing system he is able to show a profit from his operations there are more than a few who will not be so ready to make the change. "Let well enough alone" is a motto held to still by a great many shop managers.

But in other cases as in this one there is the competitive element to back the electric salesman up. The Louisville Bridge & Iron Company, for instance, is in active competition, not only with a number of Louisville competitors who are using central-station service, but it is also in competition with the outside companies which operate nationally. These have their special advantages over plants operating in smaller territories.

So it becomes not only a question of whether electrical equipment will enable the manufacturer to reduce expenses but whether it is not necessary so to equip in order to meet competition and still realize a profit on operations. This does not imply that this argument was used on the Louisville Bridge & Iron Company. As a matter of fact it was not. But it is calling attention to a point that more or less frequently will serve the power salesman to drive his other arguments home.

Equipment installed in the Louisville plant included 24 separate motors, which range in capacity from 3 to 125 horsepower. There is one of the small size, belted to an emery wheel, and one of the larger size driving the air compressor. Eight motors are of 10 horsepower. Most of these motors make above 1,100 revolutions per minute. Numbers are belted to small counters belted to various machines. Machinery equipment of the plant is usual to establishments of this character.

Electric Motor Saves $200 Over Gasoline-Engine Costs.

The rapidity with which the electric motor has ousted the gas engine and stopped its progress is one of the most remarkable features of recent industrial history. A few years ago the gas engine confidently challenged the electric motor; nowadays the only direction in which the gas engine has any field worth talking about is where electric power is not available.

Recently, in a large industrial center, there was a firm which adhered tenaciously to the gas engine. It was a conservative firm, which regarded the electric motor as a new-fangled arrangement too good to be true.

For a long time this firm resisted the arguments in favor of electric driving, but at last it consented, under protest, to a trial installation in part of the works driven by a single gas engine. Very careful records were kept of the performance of both; and the following was the result of the comparison, both as regards capital expenditure and running costs:

COMPARISON OF ACTUAL FIGURES OF GAS PLANT AND MOTORS RUNNING UNDER IDENTICAL CONDITIONS.

GAS PLANT, 26 HORSEPOWER.	
Capital cost, including installation and foundations	$1,070.00
Interest, 5 per cent	53.50
Depreciation, 10 per cent	107.00
Oil	61.00
Attendance	92.50
Water	7.30
Maintenance	53.50
Gas	340.00
	$ 714.80
MOTORS, 30 HORSEPOWER.	
Capital cost	$ 390.00
Interest, 5 per cent	19.50
Depreciation, 5 per cent	19.50
Oil	2.40
Attendance	4.90
Maintenance	9.70
Electricity	457.00
	$ 513.00

When we add to this direct saving the enormous incidental benefits of electric driving—the simplicity, convenience, reliability, absence of vibration, instantaneous control in starting up, saving in space, and so on—there can be no doubt about the economy of the electric drive. This demonstration was so convincing to the firm that the other gas engines were straightway condemned to the scrap heap.

Electric Heat for Shoe Machines.

Welting machines, shoe stitchers and bobbin winders, with electrically heated wax pots, are gradually being introduced in the shoe factories of Lynn and Brockton, Mass., replacing steam operated machines. An early type of stitcher, in common use by repair shops and small shoe shops, was equipped with a gas steam-generating wax pot. This is still operated in some shops, but since it requires about 1.5 hours to bring the wax to the proper point for application to the thread, the disadvantages are obvious. With the electric attachment, only 20 minutes are required to produce the necessary result. The steam-heated arrangement has its disadvantage, in that it requires a constant supply of high pressure steam. This is impracticable in shops of the smaller type. The electric equipment is solving problems associated with gas and steam operation.

At a shoe factory at Lynn, where gas heat was formerly used, the manager stated that the cost of electricity consumed was only about 20 per cent of that for gas.

At the office of the United Shoe Machinery Company, Boston, the concern that manufactures and rents the electrically-operated machines, it was stated that the consumption for wax pot heating averaged about five kilowatt-hours a day, which at two cents a kilowatt-hour would be 10 cents a day per machine.

ELECTRICAL CONSTRUCTION

A Department Devoted to Problems Relating to the Installation, Operation and Maintenance of Electrical Equipment

Effective Lighting of Bathrooms.

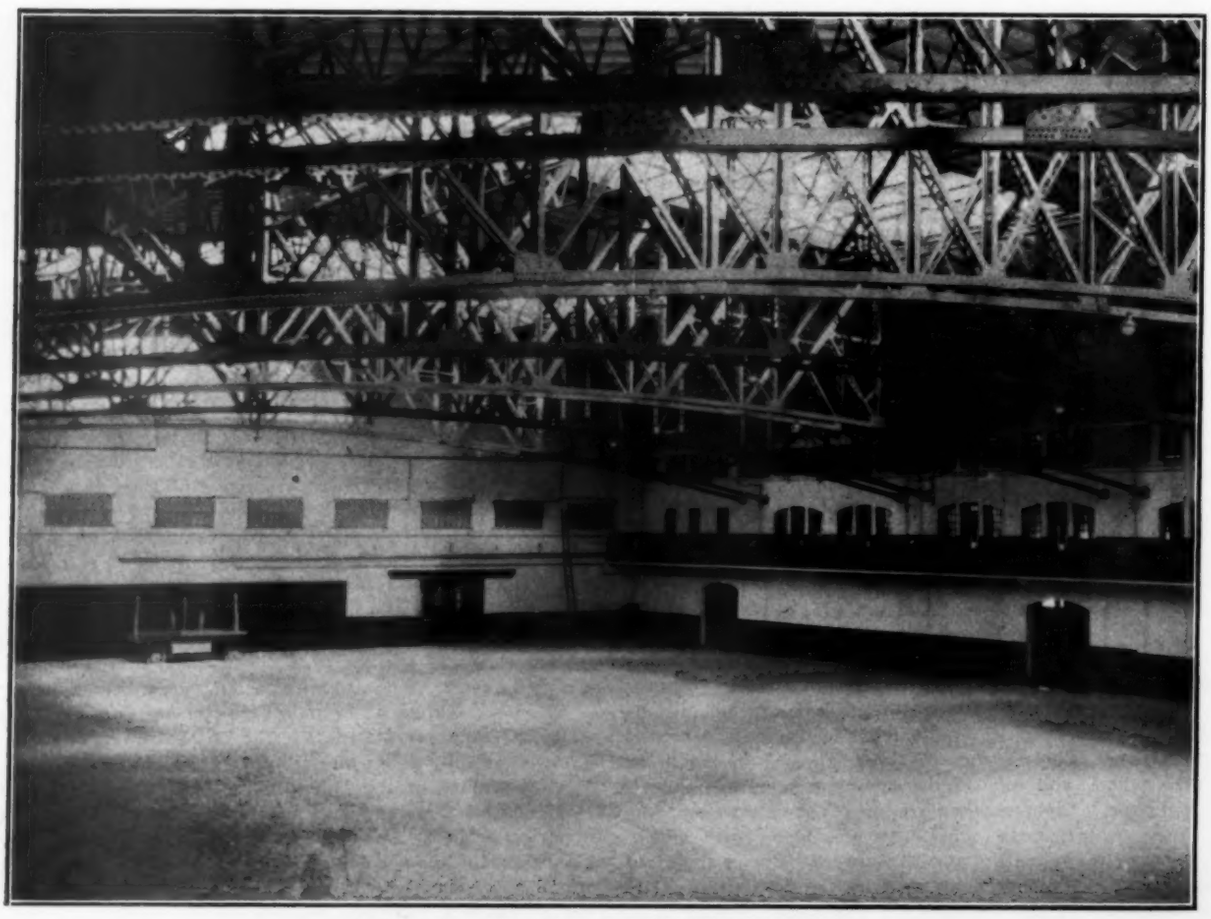
A novel and effective method of lighting a bathroom that should prove of interest to architects and contractors is described in *Lighting Journal*. The main consideration in such lighting is to provide satisfactory illumination for shaving, combing the hair, etc., before the mirror; the remainder of the room requires only a fair intensity and usually proper lighting of the mirror provides this as well. A central ceiling outlet or a single bracket at one side of the mirror does not give proper lighting for shaving because of annoying shadows. A bracket over the center of the mirror has the same objection. Placing a bracket on each side the mirror solves the problem fairly, if well placed; in many cases even this does not give as uniform illumination over the entire face, head and neck as desirable. The best solution is to use all-frosted tubular lamps, such as type T-8 Mazda; one is installed on each side of the mirror. Its base is supported by a standard angle-cap socket; the tip end is protected by a corresponding socket shell, which although only a dummy socket, looks exactly like the real one. The sockets are mounted to bring the bottom of the lamps 58 inches above the floor.

UNIQUE ELECTRICAL INSTALLATION IN BOSTON ARMORY.

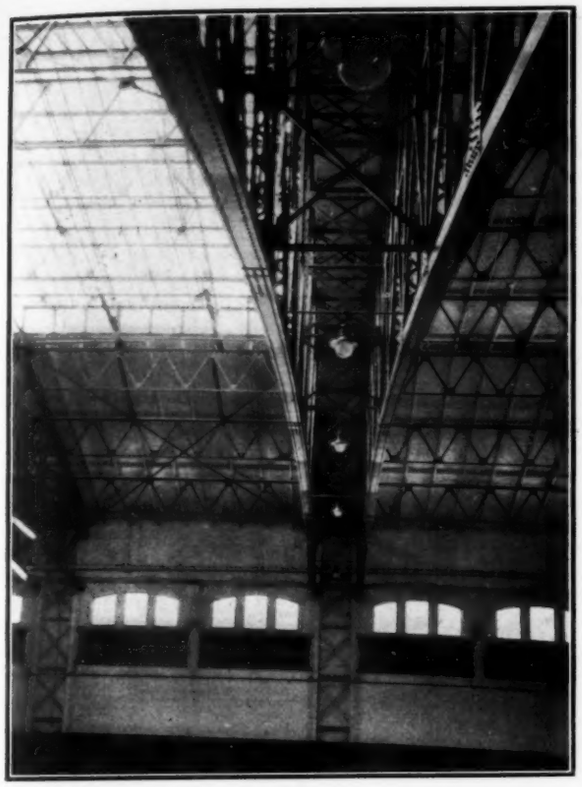
Special Provisions Necessary in Designing an Effective Lighting Installation.

The use of nitrogen-filled lamps is a feature of the illumination of the new Massachusetts Armory recently erected by the State, on Commonwealth Avenue, Boston, at a cost of about $1,000,000. This structure contains an artillery drill hall 300 by 175 feet, said to be the largest in the country, not excepting Madison Square Garden in New York. There is also a cavalry drill hall 260 by 100 feet.

Lighting of the artillery hall is by means of 750-watt type C Mazda lamps, and of the cavalry hall by 500-watt units of the same type. The former hall was laid out for 1,000-watt units, which may ultimately be used. The lamps are installed singly in enameled-metal reflectors with a 10-inch globe held in place by a ring and bayonet joint. The fixtures hang from conduit thwarts extending between steel trusses of the roof, which are seven feet apart. They vary in height with the arching roof, being 31 to 38 feet above the tanbark floor.



Lighting in Artillery Drill Hall of New Boston Armory.



Method of Suspending 750-Watt Lamps Between Girders.

In the cavalry hall the same type of fixture and support is used. At the center of each conduit section is a condulet fitting with hook and ring support, to give vertical suspension to the fixture. The spacing in the artillery hall is on 36 by 43-foot rectangle, and in the cavalry hall 34 by 29 feet, and 20 to 22 feet high.

On the wall above the gallery which runs along two sides of the larger ring, and in the mounting corridor, living quarters, stables and harness rooms are 1,235 tungsten units, ranging in size from 250 to 15 watts capacity. The total lighting load is 128 kilowatts.

The motor installation includes a five-horsepower vaccum pump, a 20-horsepower motor operating a passenger elevator, and duplicate 15-horsepower motors operating sewage ejectors.

Plug outlets in the stables provide for motors to operate a hay and grain lift, a grain crusher, and horse-clipping machines. Holophane metal shades are installed in connection with lamps in all the workrooms and in the stables.

The lighting fixtures at the main entrance are particularly handsome, being of Druid glass in Stonehenge design. The same type of fixtures is used for wall brackets above the gallery, and for the officers' quarters.

Energy is procured from the Boston Edison Company, that for lighting being single phase, and for power three phase.

The light and power equipment was installed by the Lord Electric Company, Boston.

Safety Suggestions for Foremen.

The San Joaquin Light & Power Corporation, Fresno, Cal., is continually impressing upon its foremen that their attitude towards the prevention of accidents will be reflected by the men and that utmost care should be exercised to indicate the right spirit for safety in all departments of work. To emphasize the necessity for keeping the men inspired with the thought of safety first in the fulfillment of their duties, the company has issued the following list of suggestions to foremen:

Make it your business to talk safety to the men, both individually and collectively. Have regular and frequent meetings, if only of short duration, to talk safety first.

Survey a job carefully and consider whether it is being done in the safest way. Is an accident likely to occur?

Keep safeguards in place and insist upon safety devices being used.

Stop dangerous practices whenever you see them. Remember that two-thirds of all accidents are due directly to thoughtlessness, recklessness and ignorance.

Keep the premises about your work orderly. See that proper light is provided.

Use accidents and near-accidents as a text, drawing lessons from them as to what not to do.

Watch for loose sleeves, flopping blouses and flying neckties—anything which may catch in the machinery and draw the man in.

Take an interest in your men. Have every injury, no matter how trivial, attended to by the doctor.

Never overlook a careless act on the part of any workman—point out what such action may result in.

If your duties sometimes take you away from your men, appoint one or more men as "safety overseers," who, in addition to their regular duties, will watch for dangerous places and dangerous practices.

Ask your men for suggestions on how to make things safer.

New Police-Signal System for Gardner, Mass.

A 10-box three-call police-signal system for Gardner, Mass., is recommended by the Chief of Police in his annual report. It is estimated that $5,000 would cover the cost installed.

Lighting in Infantry Drill Hall.

Lighting in Cavalry Drill Hall.

Business Building for Electrical Contractors

By George W. Hill

This is the third of a series of articles by Mr. Hill dealing with pertinent questions for electrical contractors. The philosophy of salesmanship and business building is discussed in a manner that should encourage serious thought and a greater consideration of the qualities that are essential to building a successful business. Another article by Mr. Hill, on "Organization," will be published in an early issue.

For a good many years past, it has been the opinion of those embarking in the electrical contracting business that this business was a trade rather than a business or profession.

This is, no doubt, due to the fact that usually men who enter the business are those who have come up from the rank and file of the journeymen electricians and who have spent the greater part of their time and energy in gaining a practical and technical education to the almost absolute neglect of a most important element, which is the science of business.

Some men challenge this remark and claim there is no science in business.

If it will be admitted that science is classified knowledge, or classified common sense, then it is an easy matter to prove that the great amount of knowledge pertaining to business building may be classified, just as the knowledge of farming has been in more recent years classified until we now have scientific agriculture colleges all over this country and the farmers no longer laugh at the idea of scientific farming, for this science has been applied, and the soil has been brought to a higher state of cultivation. Salesmanship and business building is the science of service, the power to make permanent profitable patrons.

Every normal man or woman has some of the qualities, in fact all of the qualities which enter into salesmanship. Some have them to a more marked degree than others, but they all haye them, and it is simply a matter of bringing these qualities together and to develop and use them for the purpose of building or getting more business.

Must Know Yourself.

In order to become a good salesman you should know yourself first. Know your goods or business thoroughly, and then know your customer. Knowing your customer means to be able to read human nature.

In order to know yourself, you should adopt some simple, yet comprehensive method of checking yourself. Learn your weaknesses and then eliminate those weaknesses so far as possible and nourish and develop the opposite or positive quality.

Some of the most valuable qualities of salesmanship are tact, memory, earnestness, desire, honesty, concentration of thought, ability to analyze your business or proposition, etc. There are a large number of success qualities but these few will be sufficient to form a basis of study of yourself. After you have begun to develop these you will naturally find others.

Did you ever call on a business man whom you had perhaps never seen before, and after having been invited into his private office, he invites you to sit down at his desk and you begin to tell him about your proposition, and you felt so easy and comfortable that there seemed to be something unexplainable set up between you, that caused you to have confidence in him, and to feel that you had gotten off on the right foot as it were, and you begin to feel at once that you were going to make the sale? You almost knew it from the beginning. This is confidence. Confidence in yourself, in the goods you were selling, in the customer, and the confidence which you had produced in the customer. Consequently, confidence is the true basis of trade.

This confidence which your customer had was induced by your actions when you entered his office and the manner in which you presented your proposition and perhaps of what he knew of your concern. He felt that you were going to give him the straight of your proposition. That you were there to render a service, which, by the way, is one of the most potent factors in business building. On the other hand you felt that this man had confidence in you and you were conducting yourself in such a manner as to not produce a negative thought in the mind of your customer, which would amount to loosing the sale.

The brief and concise manner in which you had presented your proposition to him; the true knowledge of your business which you had displayed, gained his confidence. Without confidence and service you cannot expect to build much business.

I once knew a contractor in Illinois who was the most successful business closer I had ever known. He would get 90 per cent of the contracts he went after, provided, of course, that the men he had to deal with were business men and knew and understood the value of confidence and service.

It was my good fortune to be invited to attend a meeting of the City Council with him. This was in a small town in Illinois where the city was contemplating building an electric light plant. This plant was to be a municipal plant and the people of the township had voted bonds for a certain amount of money and everything was in readiness for letting the contract.

The city fathers had conceived the idea of purchasing the material and hiring men and building this plant themselves; that is, under the supervision of the City Council. The contractor had, however, made a bid to furnish the material and labor and turn this plant over to the city complete with a guarantee of satisfaction.

After the meeting had been called to order and the preliminary work of the organization had been finished, the discussion of the plant question was taken up. In the discussion they found themselves facing several problems with which they were not familiar and they asked this contractor many questions with relation to matters on which they were not perfectly clear. They found that this gentleman was glad to answer all questions. In answering these questions he made it a point to be perfectly frank, and went to some trouble to make himself understood, even though some of the answers seemed at the time to be to his disadvantage.

Finally, one councilman got up and moved that the City Council purchase the material and hire the labor and build this plant themselves. There was a second to this motion, and it seemed that if there was ever a time that the chestnuts should have to be pulled out of the fire it was then. This contractor asked permission before they took a vote on this to talk to the council and also to ask the gentleman who had made this motion some questions. He was granted permission.

He asked the gentleman who had made the motion if he did not see him looking at his watch a few moments ago. The gentleman answered that he did. Well, then, you depend upon that watch to tell you the time of day, do you not? The answer was in the affirmative. How long have you carried that watch? He thought a moment and

said that he had carried it close to 30 years. The contractor then asked him what he should do if he should lose it. Why, he said, I would buy another.

The contractor then said to him, you have carried that watch for 30 years, or in exact figures, you have owned and carried that watch 8,740 days or 262,200 hours, and figuring that you have looked at this watch 25 times each day, which is the average number of times that a man looks at his watch, you would have looked at it 219,500 times during the time you have owned it. Now, let me ask you if you were to lose this watch, would you buy the material and try to make one for yourself, or would you go to some good jeweler who was selling watches, made by an expert watch maker, and buy a watch? The answer was that he would depend upon some expert watch maker to furnish him with a time piece. The contractor then said: "Well, you know a lot more about that watch than you do about electricity, and it would seem that it would be much more ridiculous, therefore, for you to attempt to build an electric light plant than it would be for you to attempt to make a watch, yet you have just made a motion to the effect that you gentlemen here, who know nothing of the electrical business, to build a plant for your constituency who have elected you to office to safeguard their interest. You do not even know whether the material which has been proposed to do this job is sufficient. You have no knowledge of the amount of labor required to perform this work. Perhaps, when you have the material bought and some of the labor performed, that it will exceed the amount which has been voted for the plant. What will you do then? Can you go back to your constituency and tell them that you have made a mistake in undertaking to build this plant, and had run out of money, and that you were back to them for more? They might ask you if you did not receive a bid from some one to do this job complete for an amount within the amount voted. What would you tell them? Now, do you not think that it would be a great deal better to let an expert build your electric plant as well as your watch?" The gentleman scratched his head a moment and then said, "Mr. Mayor, with the consent of my second, I withdraw my motion." The second by this time was glad to withdraw and the result was that this same man made a motion that the proposal of this contractor be accepted, and it was carried unanimously. This was tact and ability, and establishing confidence.

Must Gain Confidence.

It sometimes only takes these little concrete examples to cause even the most broad-minded men to understand your proposition. Don't be afraid to use the simple, honest little methods of gaining the confidence of your prospective customer, no matter how big a man he may be. He will appreciate it.

I want to say to you that when you have gained the confidence of the business men of your community, when you have good goods to deliver, when the people of your city come to know that your motto is service, and to the end of satisfaction, then it is that you will not be compelled to meet the competition of the contractor who believes in barter, or the doctrine "Let the buyer beware."

Where do you tell your boys to go for a new suit of clothes? You tell them to go to Merchant Jones, for instance, where you know from past experience that the goods are right, that the service is right, and where satisfaction is guaranteed.

I know of an electrical contracting concern in Milwaukee, Wis., who have so thoroughly instilled confidence into the minds of their patrons that today 90 per cent of the work which they do is time and material. Why? Because their customers know that they will not be taken advantage of. They know that this is a perfectly reliable concern and that no matter what happens in the way of an accident to their work that it will be made perfectly good. They know that when they buy devices there that they are the best and that they will give satisfaction, and the result is that this concern is making money every year and doing a comfortable business.

The two greatest elements in trade are quality of the goods and excellence of service.

Quality of goods does not mean that you should handle the highest priced articles, but such goods as are adaptable to the needs of your customer and to his pocket book, and suitable to conditions and economy in use.

If the contractors would conduct themselves and their business in a manner that would gain for them the confidence of their customers and would be more eager to serve, the matter of money making would take care of itself. If you will give the service you will get the money.

There is no doubt but that there are men who are natural born salesmen and business builders, and if they are so fortunate as to have this natural bornness, they should so appreciate it as to have a desire to become even more efficient in their business and study how they can improve each one of the many qualities with which nature has been so generous.

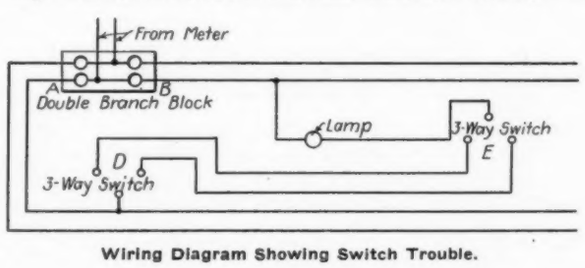
Study yourself, analyze yourself, learn wherein you are weak and then learn how you can improve upon your weaknesses and bring them to a point of perfection, and they will become positives rather than negatives.

Study your business. Know all there is to be known about your business. Study your employees and your patrons. This is the study of human nature. Learn what your patrons like. Learn what their demands are, and to the end of satisfaction attempt to meet these demands, and without any thought as to what your competitor is doing, you will increase your business year after year.

Salesmanship and business building is merely the power to know how and when to serve and to be able to understand your business, yourself, and your patrons and to be absolutely sure that you are doing this.

Locating Trouble on Three-Way Switches.

Several times while hanging fixtures I have run across trouble from the switches of three-way lighting circuits being improperly connected, resulting in the three-way circuits being dead. On investigating these cases I found the trouble in many instances to be due to the cause illustrated herewith. In order to save time, labor and wire, the wireman frequently connects on to the most convenient wires regardless of whether or not these are on the same circuit. This is perfectly proper, if care is taken in connecting the three-way circuit to opposite sides of the line. However, when the branch blocks are put on in finishing, the two wires that are tapped on for the three-way light may be connected so as to have the same polarity, as shown in the diagram. When this is found, the remedy is to reverse the wires on one side of the branch block, as at *B*. In case of a big job with many circuits, the best way is to short-circuit the switch wires at *D* and *E* and then reverse one circuit at a time. Of course, before doing this it is necessary to look for any possible wrong switch connections and defective switches.



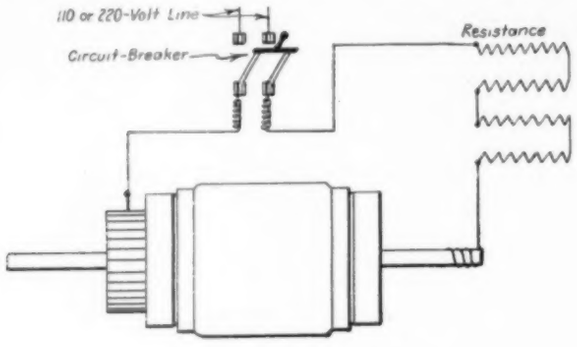
Wiring Diagram Showing Switch Trouble.

J. B. Story.

Locating and Removing Grounds in Armatures.

In one of the recent issues I noticed a method described for easily locating a ground in the armature of the generator or motor without using expensive instruments. For this purpose I have used a method that I think is simpler than the one described.

According to my method, simple and handy devices are used for locating slight grounds. The necessary equipment consists



Method of Locating Armature Grounds.

of a bank of resistances, or lamps, which will allow the passage of about 10 amperes of current from the lighting circuit. A double-pole circuit-breaker is used, although a simple double-pole fused knife switch can be used in place of this, if no circuit-breaker is at hand; however, a circuit-breaker is much more convenient as it takes much less time to close the breaker than it does to reload a fuse. Connect from one side of the circuit-breaker to the resistance and from the opposite side of the resistance connect a wire to the armature shaft. Connect from the other side of the circuit-breaker to the commutator. Close the circuit-breaker and watch for smoke or sparks at any place on the armature. If this does not show where the ground is located, I cut out some of the resistance and raise the current to 25 or 30 amperes. If the trouble is only a light ground, this will usually locate the exact place where the trouble is.

Should this fail to locate the ground, raise the tap coils out of the commutator and test each bar separately. When the bar that is grounded is reached the lower coil can be raised and tested to determine whether the coil or the commutator is at fault.

J. H. Daniel.

Cleaning Brass Mountings on Electrical Apparatus.

The following method of cleaning brass articles, which has been found completely successful, may prove of value to electrical contractors and dealers as well as manufacturers. It can be used for fan-motor blades, fixture parts, name plates, etc.

The brass mountings should be first cleaned of dirt by dipping for a short time in boiling soda lye made by dissolving 4 parts by weight of the lye to 1,000 parts of water. This usually requires only three or four minutes with slightly discolored goods. The time never exceeds 20 minutes. While still warm, if possible, the articles are dipped into a mixture of nitric acid, 60 parts by weight; sulphuric acid, 40 parts; common salt (sodium chloride), one part, and lamp black, one-half part. This pickling mixture must be carefully made in advance, as there is considerable heat generated when pouring the sulphuric acid into the nitric acid. The sulphuric acid should be poured in very slowly, keeping the mixture constantly agitated, and keeping the face well away from the tank or jar. The place should be well ventilated, as when the salt is introduced chlorine gas is formed. This gas is hard on the respiratory organs. The mixture should be made and kept in a glass or earthenware jar, not metal; it must be at least 24 hours old to give good results. The objects will take on a fine golden-yellow coloring after dipping. After the article is dipped it should be rinsed in plenty of clean water and dried on a hot iron plate. An electric disk stove is good for this operation.

After the articles have thoroughly dried and while still warm they should be lacquered. The gold lacquer or varnish as supplied is too thick for dipping or brushing. This should be thinned with alcohol, 1 part by volume of lacquer to 10 parts of alcohol. The articles should be dipped and then put on the hot plate to dry.

H. E. Weightman.

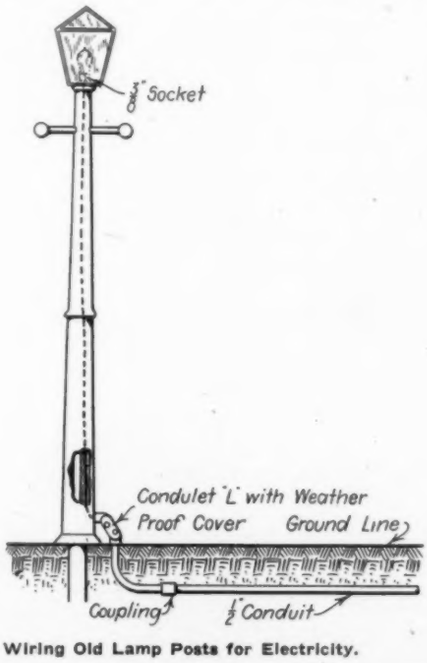
Connecting Flush-Type Switches.

I find if a flush-type switch is connected up with the blades in the "On" position, there is less tendency for the inside mechanism of the switch to be drawn out of place by the connection screws than if it were connected up in the opposite position.

Walter S. Fretz.

Wiring Old Gas Lamp Posts for Electric Light.

Recently I had a job equipping some old-fashioned cast-iron gas lamp posts for electric light. The gas had been turned off from the posts for some time. The problem was to install the wires with the least trouble and cost. I drilled and tapped out a hole for one-half-inch pipe just a few inches above the ground line; I found the wall thickness of the post to be only about one inch, leaving a space inside three inches in diameter. I put into this hole a close nipple and to it screwed a weatherproof L-shaped Condulet. From this an ordinary conduit ell and coupling connected with one-half-inch conduit laid in a six-inch trench running to the cellar. The cover of the Condulet L is just above ground and is easily accessible in case of trouble. It was an



Wiring Old Lamp Posts for Electricity.

easy matter to fish brewer's cord down through the post and connect it to duplex wire within the L Condulet. With this arrangement it is not necessary to take up the post or conspicuously interfere with it. If a post in a narrow sidewalk were to be dealt with, it would be better to tap the post at either side instead of nearest to the building.

J. B. Story.

DOLLAR WIRING KINKS

Every reader is invited to contribute to this page. It does not matter how few words are used to explain a "Dollar Wiring Kink," provided the idea is made clear; if a diagram is necesary, a rough pencil drawing will serve. The idea itself must, of course, be new and bright. A dollar will be sent to the contributor upon publication.

Hooking Snakes.

In fishing through long runs of conduit in which the fish tape is not long enough to reach the other outlet or where there are too many bends in the line, it becomes necessary

Scheme for Fishing Through Long Runs of Conduit.

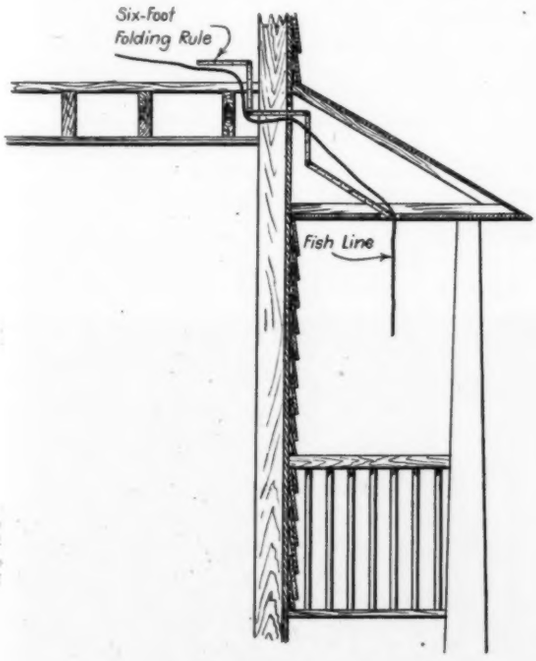
to use another fish tape from the opposite outlet and catch the hook of the first tape.

In making the hooks, just make an ordinary hook, then twist sidewise a little more than the width of fish tape. By this method the hooks will always catch, thereby saving time, labor and quite often your temper.

Charles W. Myers.

Fishing to Drop Ceiling on Porch.

Frequently the wireman has trouble in running a snake through to the outlet when dealing with a drop ceiling, such as is commonly used on front porches. I find that a six-foot rule is a handy article to use in this case, since after getting it into the pocket in the floor and through the sheeting boards, it can be opened up six inches at a time and with a fish line attached to the end it can easily



Fishing Wire for Porch Light.

be pushed directly into the outlet opening. A piece of capping, such as supplied for wood molding, will also work, as it can be bent in almost any corner without breaking.

J. C. Walsh.

A Simple Burglar Alarm.

The two accompanying sketches illustrate two forms of a continuous-ringing burglar-alarm system actuated through a solenoid coil and a return ground. The simplest form

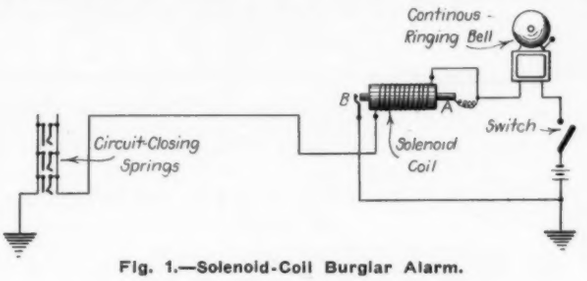


Fig. 1.—Solenoid-Coil Burglar Alarm.

of this is shown in Fig. 1. The iron core *A* of the solenoid is arranged so that when the coil is energized it pulls the rod in, thus causing the end of it to make contact with the the point *B*. This closes the local circuit including the continuous-ringing bell. The latter will continue to ring until the switch is opened. The iron rod *A* can then be pulled back into normal position.

A modification of this is shown in Fig. 2. In this case

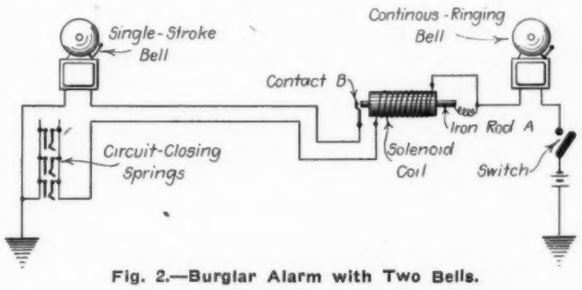


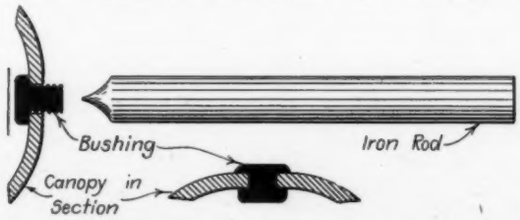
Fig. 2.—Burglar Alarm with Two Bells.

instead of a simple local circuit there is provided an additional single-stroke bell. When any of the circuit-closing springs makes contact and the solenoid is energized, the iron rod *A* engages the contact *B* and thus closes the circuit of both bells. This system is both cheap and effective. I have used it repeatedly with good results.

Edward Kemp.

Upsetting Bushings for Canopies.

In putting one-eighth-inch rubber bushings into canopies, etc., I use a small tool, such as the one illustrated in the accompanying sketch. It consists of a piece of round three-eighth-inch iron ground to a point having about the same bevel as a center punch. By slightly heating the end of the iron and applying this to the rubber bushing, the small end thereof is turned up against the metal of the canopy and is thereby tightly locked in place, making a tight, smooth and good-looking job. For three-eighth-inch



Upsetting Bushings for Canopies.

bushings, a rod five-eighth-inch in diameter should be used. This scheme can also be used for bushings in portable table lamps and the like, which are easily worked loose unless upset in the manner indicated.

J. B. Story.

ELECTRICAL MERCHANDISING

An Exchange of Ideas and Experiences on Advertising and Selling Methods, and Store-Keeping for the Dealer in Electrical Goods

WINDOW TRIMMING A MERCHANDISING FACTOR.

Proper Attention to Timeliness, Illumination and Detail of Window Displays Necessary.

The following paragraphs were prepared from an article by W. E. Clement, the commercial manager of the New Orleans Railway & Light Company. The article appeared in the January issue of *The Bulletin*, the monthly publication of the United Gas & Electric Engineering Corporation, New York, N. Y.

The art of the window dresser can be compared to that of the stage director. How often have we witnessed productions by eminent actors, in which something essential to success was lacking in the production; that is, success beyond mere mediocrity. At the time, we may have been at a loss to comprehend the situation, but upon analyzing it the secret was found to be some inattention to detail in plot, scenery or settings. Therefore, in window trimming, use only the best, which includes accessories, as well as window-dressing talent.

The comparison is not entirely out of order, as the best dressed windows in nearly all cases portray a scene of some sort, which, to be most effective, should be "psychologically correct," or chime in with some popular movement or subject in order to get the public interest. This class of window dressing has been found far superior to the old method, which consisted of piling goods with large price tags in a window. While this may sound elementary, it is of such importance that one must lay stress upon it.

The writer has seen windows, which essayed advertising one's own, and in some cases other classes of merchandise, that were dismal failures, all due to the eagerness of the advertiser to cram all he could in the window in a mad effort to reach the buying public. This fault is by no means confined to the small or inexperienced dealer. Make it a rule never to place more goods in a window than is necessary to produce the desired effect.

Advertising two different classes of goods in the same window is very poor form, and always fails. Concerns having but one display window should never advertise two different lines at the same time. To do so is about as deplorable as advertising electric fans, using a snow scene for a background instead of one depicting the pleasant breezes of spring.

Proper Illumination.

The purpose of all display windows is to advertise not only by day but by night as well. The advertising of many windows is lost when night comes. This should not be, for the hours after dusk are the most valuable. The business cares of the day being over, the minds of pedestrians are in a more receptive mood than during the business hours. Great care should be taken to see that windows are properly illuminated, as one not properly illuminated compared to one that is would be just as odious as comparing the wax candle to a Mazda lamp. The lighting of display windows is not always a question of expense, but of efficiency. The properly lighted window first attracts the attention of the onlookers and then holds it.

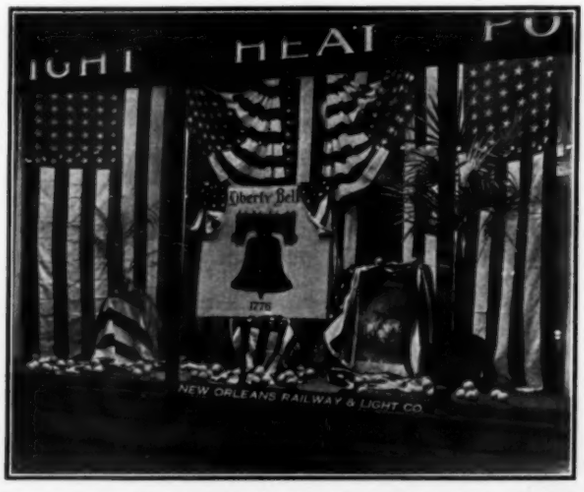
In order to attract attention the window must be brilliantly lighted so that it is conspicuous at a reasonable distance. Every window, however, presents a distinct problem in lighting. Too much time cannot be given to selecting the right type of reflector, one that will conceal the lamp filament from the passerby and at the same time illuminate the window evenly. In short, concentrate all of the light in a brilliant flood on the goods and prevent the glare of the lamp striking the eyes.

Windows should be kept lighted as long as the streets are full of people because the majority of people only have opportunity for observation after closing hours.

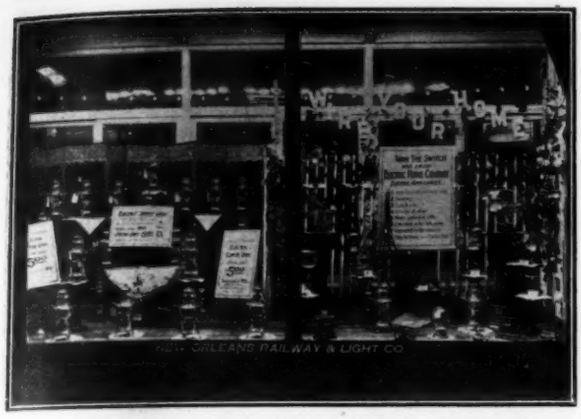
Seasonable Advertising.

The majority of articles sold by the electrical merchandiser can be classed as "hardware," and all window dressers will agree that it is the *hardest* class of goods with which

An Attractive Arrangement of Show Cases and Portable Lamps in a Display or Sales Room.



Window Decoration Suitable for Washington's Birthday or Other National Holiday.



Appliance Window Display Which Attracted Considerable Attention in New Orleans.

to make an effective display. Therefore, endeavor to make your window trimming as nearly seasonable as possible. Under the term, "seasonable advertising," is meant, for example, Hallowe'en. This event should be taken advantage of, as it makes an admirable subject for the window trimmer to work out. "Ye Olde Time Hallowe'en" may be depicted and should prove a drawing card. Some may say, "Only for children," but such would not be the case, for the older people can enjoy these creations as well. For instance, place in one of your windows a modern electric range, with but one placard upon it, reading, "All modern Hallowe'en suppers are cooked by me." As the majority of children are accompanied by their elders, the window would receive its full share of patronage, and that wonderful "human interest" incentive would be brought fully into play.

All seasons, such as Thanksgiving, Christmas, New Year's, Easter, Fourth of July, special local celebrations, carnivals and the like should be taken advantage of in advertising. No expense should be spared in order to have the window trimmed appropriately during the seasons.

Joint Advertising.

Part of the aim in advertising is to impress upon the public the convenience as well as the low cost of operating electrical appliances, and this could not be accomplished without the aid of the newspaper. Fully 75 per cent of those who view show windows, or who come to purchase, have been continually reading the advertisement in the newspapers, proclaiming the benefits to be derived from the use of the goods. The remaining onlookers may only be those who accidentally passed. The newspapers educate and the show windows accomplish the desired end by appealing to the prospective purchaser and instilling the desire to learn more about the appliances shown. Therefore the newspaper is indispensable and should always be used in conjunction with window advertising.

Again we say, bring in the "human interest" motive, and in working out your plot or scenario, as it might be called, attempt always to keep in mind that "pictures of life" are of the most absorbing interest and never fail to attract attention and produce sales.

Electric Cooking in California.—A San Francisco newspaper tells of a hobo who has been following one of the electric traction lines in that state, and cooking his meals electrically. His apparatus is connected between the third rail and the main track. He also carries an attachment intended to connect to trolley wires. A country where electrical conveniences are in such general use, and where the climate permits of sleeping out of doors, would seem to have solved the problem of the high cost of living.

SUGGESTIONS FOR AN INEXPENSIVE WAY OF MAKING YOUR COLLECTIONS.

A Successful System Based Upon Methods of Persistency and Courtesy.

By W. B. Parker.

Slow and bad accounts cause the average business man much annoyance and loss and are often the direct cause of bankruptcy. It therefore follows that any method of handling this class of accounts that shows a maximum of efficiency with a minimum of effort, friction and expense is worthy of serious consideration.

This article will outline a system that is the result of over fifteen years' experience of an attorney and credit man for several large business houses. It is adapted to either a large or small business and has "made good" wherever adopted.

The basic idea is that a business man can, in most instances, handle his own collections to better advantage than by turning them over to collection agencies or others, and that it is neither necessary nor politic to use bluffing or intimidating methods. It has been found that the basic elements of a successful collection system are persistency and courtesy, not bluff and threats. You know that a severe storm, or a series of them, will have small effect on stone, while a constant dropping of water on the same spot will wear it away.

The system here outlined consists of five letters and a legal postal card follow-up system, and will keep after the slow debtor over forty-five days at a total postal cost of not exceeding 20 cents. The forms given for the letters are to be written on the letterheads of the business house using them and the card form on ordinary government postal cards. They will not be nearly as effective if printed and afterwards "filled in" and they are so short that it is not at all necessary to do so, even where several hundred accounts are involved, as only 25 minutes of a typist's time is required on any one account, even if it is necessary to continue the system to the very last card, which will very seldom happen.

When intending to use this system on a certain number of accounts it is best to make an alphabetical list of them on a long sheet of paper, noting the name, address, amount and date of the last item, leaving about an inch of blank space after each account in which to note the dates of mailing the form letters and cards. When an account is paid, or satisfactory arrangements made, it should be crossed off the list, thus leaving a correct list for the next mailing.

Letter No. 1.

Mr. Slow Pay,
Chicago, Ill.

Dear Sir:—

In looking over our books today we find a past due balance standing against you in the amount of $....., running back to .....

Will you kindly mail us your check for this amount or advise us at once if you find the balance incorrect.

Thanking you in advance, we remain

Yours very truly,.

Letter No. 2.

Mr. Slow Pay,
Chicago, Ill.

Dear Sir:—

We wrote you ....., regarding a past due balance on your account of $....., running back to ....., and so far have received no reply.

Please let us hear from you at once, so that we will know whether you consider the balance correct, and when we may expect your check.

Yours very truly,

Letter No. 3.

Mr. Slow Pay,
Chicago, Ill.

Dear Sir:—

Our letters of ..... and ..... regarding a past due balance of $..... on your account remain unanswered.

It certainly seems to us that you might at least grant us the courtesy of an answer, even if it is inconvenient for you to send us your check just at this time.

Kindly favor us in this regard, and oblige,

Yours very truly,

Letter No. 4.

Mr. Slow Pay,
Chicago, Ill.

Dear Sir:—

We are much surprised at your failure to answer any of our several letters regarding your past due account. Our letters have certainly been courteous, and we feel that we have treated you fairly in every way.

You know, of course, that unless we hear from you we will be compelled to adopt other means of collection, which we very much dislike to do.

It will save both of us useless expense and annoyance if you will let us hear from you at once, stating just what you propose to do.

The writer will hold this account on his desk until the morning of ....., and will depend upon hearing from you by that time.

Yours very truly,

Letter No. 5.

Mr. Slow Pay,
Chicago, Ill.

Dear Sir:—

As we did not hear from you this morning we have fully decided to take other steps to enforce settlement of that past due account.

However, a business acquaintance advises us that he believes you to be entirely prompt and reliable, and we have therefore decided to wait a few days longer.

You must certainly realize that your credit standing depends on your fair dealing, and fair dealing certainly requires you to answer our letters.

Of course, we realize it is entirely possible that you have neither received nor read our previous letters personally in view of the statement referred to above we shall expect to hear from you at once.

Yours very truly,

Postal Card Form.

We wrote you ....., ..., ..., ..., and ..... No reply. Why? It is important that we hear from you at once.

Send the letters weekly and cards every other day for 20 days, following letter No. 5, allowing three days for answer to last letter. Fill in the blank spaces in the second line of card form with the dates of the five preceding letters, as 1/1, 1/7, 1/14, 1/21 and 1/28, thus making a second line of dates, *in figures*. Add nothing to the wording of card form except signature, which should be written with pen, down toward right-hand bottom corner of card; do not date.

It will be noted that the first three letters are very short indeed, and yet they say all that is necessary or advisable to say at this stage of the correspondence, and also ask a question that demands an answer whether the debtor is able to pay just at that time or not. They are so mild that they can be sent without giving offense, to perfectly good, but slow, debtors and yet they form an effective basis for the letters that follow to the slower and more doubtful debtors.

The fourth letter takes the place of the usual "threat-to-sue" letter and is fully as effective, without committing the writer to any definite action whatever, but leaves the matter open so that he can effectively continue his mail campaign. The fifth letter is a reversal of the "threat-to-list," or let other business men know of the indebtedness, and is even more effective without being offensive. It flatters instead of threatens and winds up by giving the debtor an excuse for his past failures to respond to the letters that have been sent him.

But some men do not read letters and it does not much matter what you write them. Here is where the postal cards come in. While they say nothing whatever about an account, and are consequently perfectly legal, yet they furnish an inexpensive form of persistency that certainly does get results.

In conclusion, it is emphatically stated that this system will not get money from a man who has none, or secure any other impossible result, but it will bring in the most money out of the past due hundred dollars, if used according to instructions, and it certainly will not involve the user in unnecessary expense or useless litigation.

Window Display Operated by Twelve-Year-Old Girl Wins First Prize.

Winners have just been announced in a window-display contest recently conducted by the National Lamp Works of the General Electric Company. Sixty prizes, ranging in value from an automobile to $5, were awarded, to which were added 80 "honorable mentions" of $1 each. The contest was operated on a basis which gave each distributor of Mazda lamps equal opportunity to win any of the 50 general awards or the special award offered for distributors in his class or territory. One feature which stimulated interest in the contest was the stipulation that any contestant was privileged to enter as many displays as he wished, though no single display could win an award under more than one classification.

Window Display That Won First Prize in Contest.

Entries were judged on scale of ten points, divided as follows: Selling value, five points; attention value, two points; unusual ideas, two points; harmonious arrangement, one point. The judges were Homer E. Niesz, Commonwealth Edison Company, Chicago; A. J. Edgell, Society for Electrical Development, president of the International Display Managers' Association, and N. H. Boynton, manager Publicity Department, National Lamp Works.

First prize was awarded the Lehigh Valley Light & Power Company, Allentown, Pa., for a clever display which told a convincing story about National Mazda lamps by means of a series of 17 placards operated by a 12-year-old girl. The window was arranged to represent the library of a home, with lamps and the placards as the center of attraction. So effective was the display that over 1,500 lamps were retailed during the two days it was on exhibition.

Ingenious Maintenance of Service in a Moving Telephone Exchange.

"Service First" is coming to be more and more the slogan of utility companies, and many ingenious schemes have been resorted ot in order to maintain service continuously, or to restore it as speedily as possible after an emergency interruption. A most original achievement in this line must be credited to R. E. Alleman, of the Jennings (Okla.) Telephone Company.

The Jennings company recently bought a 330-line Western Electric switchboard, which was originally installed in a one-story frame building. The building was hardly up to the standard of the rest of the telephone company's equipment, so Mr. Alleman soon decided to erect a two-story brick building of more pretentious size and appearance.

It was planned to use the same ground lot, so one morning the old frame building, operators, switchboard, office and all, were moved bodily into the street, and construction on the brick building began. Telephone service had not been interrupted an instant. The average man would have been satisfied with a performance of this kind, but to Mr. Alleman, who has a store of ideas on uninterrupted service, it seemed almost commonplace.

The switchboard room in the new building is on the second floor. Before the work was quite complete a frame elevator was erected upon the sidewalk between the old and new exchanges, and everything placed in readiness. On moving day the switchboard and its two operators were rolled out of their old exchange, into the elevator, hoisted to the second floor, and rolled inside, without losing a single connection.

REFERENDUM ORDERED ON MAINTENANCE OF RESALE PRICES.

Committee of the Chamber of Commerce of the United States Presents Exhaustive Report.

The Board of Directors of the Chamber of Commerce of the United States have voted that the report of a special committee of the National Chamber on the maintenance of resale prices shall be submitted to referendum. The committee had reported to the Board that it was not able to present a unanimous report.

There are ten members of the committee. Its chairman is Paul T. Cherington, a professor in the Harvard Graduate School of Business Administration. The reports of the different groups of the committee cover something like 19 printed pages, and have 75 pages of appendices.

A majority recommendation favoring legislation permitting price maintenance was signed by seven members, two of them, however, modifying their assent by filing a supplementary report. With the majority report came the comment that a National Chamber committee had rendered a report last February favorable to the principles of price maintenance and the majority members saw no reason in any way to modify the conclusions arrived at and given to the Chamber at that time.

Back Up Report Favoring Price Maintenance.

"But on the contrary," the comment continued, "after additional exhaustive investigation by consulting a large number of organizations, composed of many thousands of members in all branches of trade and industry, as well as many individual producers, distributers and consumers, and after having collected evidence from a great many sources, we repeat the language of the committee's previous resolutions of February, 1915, as our report and conclusions, viz.:

"'Your committee is convinced that legislation permitting the maintenance of resale prices, under proper restrictions on identified merchandise, for voluntary purchase, made and sold under competitive conditions, would be to the best interest of the producer, the distributer and of the purchasing public, or consumer.'"

Federal Trade Commission Aid Suggested.

The supplementary report, signed by two members who also signed the majority report, recommended that injurious price cutting be included within the scope of the jurisdiction of the Federal Trade Commission over unfair methods of competition.

Advantages Argued for Price Maintenance.

Conclusions of the majority are that the advantages of price maintenance are partly economic and partly social.

(1) A properly regulated system of price maintenance on identified merchandise made and sold under competitive conditions puts the emphasis in competition upon quality and service, while at the same time, it provides for the public adequate protection against extortion.

(2) Price maintenance under these conditions preserves the social advantage of an adequate incentive to invent and devise new products.

(3) Price maintenance under these conditions serves to prevent monopolistic control of production processes by powerful distributors.

(4) Price maintenance under these conditions preserves the social advantages of such distribution conveniences as are represented by neighborhood stores and by small, but skillful merchants. In some trades, it is the sole guarantee of the preservation of the accepted system of distribution. For instance, it assures the preservation of the book stores as individual enterprises. If the social value of such factors as these is less than their economic cost they are not worth preserving. But who is ready at this time to encourage their annihilation? It is noteworthy that the agitation in favor of restoring to producers the control of resale prices originated with the small, independent retailers, and that most of the opposition to it comes from the large and powerful retail concerns.

(5) The right of the producer to set resale prices is an accepted principle of business law. It has been restricted recently in this country by close decisions of the Supreme Court, none of which was decided on the basis of general principle alone. The committee believes that in the long run the public interest will be best served by legislation specifically permitting this method of doing business in identified articles made and sold under competitive conditions.

Proposed Federal Trade Provisions.

Signing the supplementary report were E. S. Rogers and Professor Cherington. It proposes to insert in Section 5 of the Federal Trade Commission Act in statutory language provisions which will have the following effect:

In regard to products that are identified in their sale to the public by name, brand, or trade-mark—and that are made and sold under competitive conditions: No merchant, firm, or corporation shall offer such articles for sale at a price other than that stipulated by the producer for the original sale of the articles at retail (provided the producer has given due notice of such price to the retailer by mark upon the article or otherwise); with the purpose or effect of (a) Making it unprofitable for other retailers to handle said articles. (b) Promoting the sale of a substitute or imitation. (c) Attracting trade away from competitors, where the result is to injure the reputation of said articles or the good-will of their producers or materially to impair the general distribution of said articles.

While the work of the committee has been confined in its instructions to identified merchandise, it believes that the principle involved in this recommendation is capable of extension to a much wider field and that the predatory cutting of prices on merchandise in general has been and is a favorite method of oppression on the part of unfair business to destroy small competitors and local producers and that legislation could very properly define such practices as an unfair method of competition.

Oppose Federal Legislation.

With the formal report which makes its adverse recommendation in a space of four lines, the minority filed an explanatory statement. They take the ground that the recommendation of the majority is directly contrary to the conclusions of Federal and State courts on matters of principle, that the right to fix resale prices supposed to exist for a short time was never understood to exist except as an incident to patents, and that anti-trust provisions in the constitutions and laws of twenty-nine states indicate a policy expressly inconsistent with the idea of maintenance of resale prices. The minority dwell upon the importance of trade being "unhampered and unshackled by the requirements or commands of any men, or combinations of men, or any systems whatsoever," recalling the well-known principle of the common law that there could be no valid restrictions governing the transfer of articles of trade from hand to hand. Finally they take the stand that legislation legalizing price maintenance will give rise to a situation such that it will become difficult for men who seek to enter manufacturing and small merchants to establish themselves.

With the minority report, as with the majority, a brief of the law as interpreted by this side is printed.

Russian Nitrogen Plant.—A plant for the fixation of atmospheric nitrogen is to be established in the northern part of Russia, near the White Sea. It will use the Birkeland-Eyde process.

PUBLIC SERVICE COMMISSIONS

A Resume of Important Decisions of the Week Affecting Electric Utilities

MAINE.

The Bethel Light Company has asked approval of an issue of new stock to the value of $21,000, the proceeds to be used for the purchase of property of the Morrill Springer Company, Bethel, Me. A hearing will be given by the Public Utilities Commission on February 15, at Augusta.

Limerick Water & Electric Company. The Limerick Water & Electric Company has petitioned the Public Utilities Commission for authority to purchase the property of the Steep Falls Lighting Company, and the latter company asks permission to sell. A hearing will be held on the two petitions at Augusta.

KANSAS.

Judge C. F. Foley, of Lyons, Kan., has been reappointed by Governor Capper as a member of the Public Utilities Commission of Kansas, for a term of three years. Judge Foley was appointed December 8, 1913, to fill the unexpired term of Henderson S. Martin, who resigned to become vice-governor of the Philippine Islands.

MARYLAND.

Testing facilities and voltage variation were the principal topics taken up at the first day's session of the conference between representatives of Maryland light and power companies and the Maryland Public Service Commission. It is proposed to require, according to the rules which were prepared by Chief Engineer Phelps of the Commission, that each utility company shall after May 1, 1916, provide portable indicating voltmeters for testing voltage regulation and that each utility serving more than 250 consumers shall in addition provide one or more portable recording voltmeters giving a continuous record of not less than twenty-four hours' duration. The records made shall be preserved for the inspection of the Commission. Testing equipment for service watt-hour meters, switchboard instruments, recording voltmeters and other electrical instruments in use must be provided by March 1 next. Reference standards of all kinds will be adjusted by the Commission at least once a year.

NEW YORK—First District.

Governor Whitman appointed Travis H. Whitney, the present secretary of the Public Service Commission of the First District, as Public Service Commissioner to succeed J. Sergeant Cram, whose term expired February 1; and Charles S. Hervey, deputy comptroller of the City of New York, as Public Service Commissioner, to succeed George V. S. Williams, who resigned January 31. Governor Whitman has now made five appointments to this Commission—the full membership.

The Public Service Commission for the First District has requested the Interborough Rapid Transit Company to make provision for supplying electric current to the New York Municipal Railway Corporation for the operation of its lines under the Dual System contracts. These contracts allow the New York Municipal Corporation to purchase power for ten years after the new system is placed in operation. The Interborough will have power-house capacity to produce much more current than it will need for the operation of its own system, and the Commission therefore suggests that it will be a saving both to the companies and to the city if it should allow the New York Municipal Corporation to purchase the needed power. In this connection the New York Municipal Railway Corporation recently submitted a proposal to the Commission to purchase power from the Transit Development Company at a flat rate of one cent per kilowatt-hour. The Commission disapproved this proposal on the ground that the flat rate was too high. No reply has yet been received from the Interborough Company.

PENNSYLVANIA.

Towamensing Electric Company.—An opinion has been filed by Commissioner Breit overruling the objections filed by the borough of Lansdale to the granting of a certificate of public convenience to the Towamensing Electric Company, to operate in the township of that name in Montgomery County, and the charter application will be sent to the governor. The decision was rendered in a case which has attracted general attention because of the effect it may have in other parts of the state. The borough furnishes power to consumers living outside of its limits and declared through its representatives that it was furnishing enough to meet the demand.

The opinion says that the borough claims to have the right to furnish power outside of its corporate limits, under the borough code, but this question need not be determined now, said the Commission. It is declared "it could not be safely maintained when service is furnished from the surplus current of a municipal plant, that the same diligent effort will be made to develop the territory and install facilities within the reach of everyone desiring service as would be the case with a private company, since the latter is always more or less engaged in seeking ways and means of pushing forward its plant operations."

Philadelphia Electric Company.—In presenting testimony before the Commission in the case of the City of Philadelphia vs. the Philadelphia Electric Company, President Joseph B. McCall, of the latter company, gave some interesting figures tracing the development of his company since its incorporation.

In submitting estimates of the present value of the stock of the company, Mr. McCall said that the Philadelphia Electric Company, of New Jersey, was incorporated on October 5, 1899, with a capitalization of $25,000,000 at a par value of $25 per share. The first assessment on this stock, amounting to 10 per cent, was made on November 1, 1899, and the last one, an assessment of 20 per cent, was made on December 1, 1913. The capital stock issued, he said, totals $24,987,750. Only $18.50 per share has actually been paid in, $4 having been credited to the stock from the surplus of the earnings. The average returns to stockholders since 1899 have been 7.42 per cent.

Mr. McCall also showed that $15,014,142 worth of securities have been issued, and that the total number of share and security holders is 14,300. He said the Philadelphia Electric Company, of Pennsylvania, the defendant, was incorporated on October 27, 1902, with an authorized capital stock of $25,000,000 of which $17,000,000 has been issued at a par value of $100.

NEW APPLIANCES

A Weekly Review of the Latest Developments and Current Information Respecting Electrical and Kindred Mechanical Appliances

Hubbell Three-Wire Plugs and Receptacles.

Although portable electrical appliances that can be operated from extension cords with attachment plugs are now almost invariably of the two-wire type, there is likely to be an increasing development of such devices for three-wire service. Thus there may be calls for three-wire, two-phase or three-phase motors, or split-phase, single-phase motors, triple-voltage, direct-current motors, larger electric heaters or other devices that require three-wire service direct to the device itself.

Anticipating these and other already developed needs, the firm of Harvey Hubbell, Incorporated, Bridgeport,

Fig. 1.

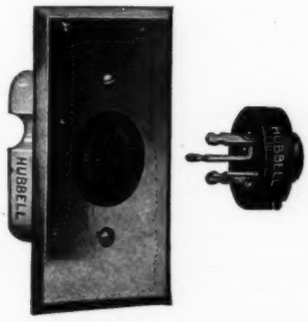


Fig. 2.

Fig. 3.

Fig. 4.

Several Forms of Hubbell Three-Wire Plugs and Receptacles.

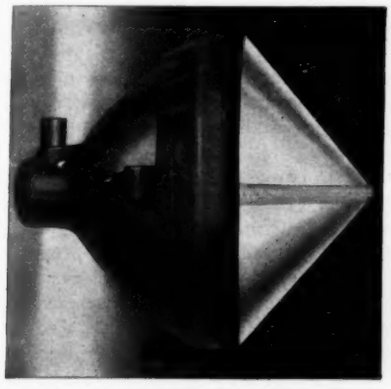
Conn., has placed on the market a line of three-wire attachment plugs and receptacles. Fig. 1 shows the separable plug, which has a composition cap and special porcelain base. A three-wire flush wall receptacle with the same type of plug or cap is shown in Fig. 2. A porcelain receptacle with two kinds of caps is shown in Figs. 3 and 4; one of these is the composition cap, while the other is metal-covered.

In all cases it will be observed that the three contacts of the cap as well as the slots in the receptacle or base part are arranged so as to insure putting the two parts together in but one way, which is always the right way. This arrangement was used to insure proper polarity in case of direct-current circuits and of proper connection of the neutral where a neutral wire is included in the three-wire supply. The longer contact and the radial slot are always made neutral. This contact is made first and broken last.

Among the uses for this new line of plugs and receptacles already developed is on portable telephones in restaurants, hotels, etc., on double bell systems operated from extension cords with two push buttons; for grounding the frames of electrically operated cash registers, the neutral contact being connected to ground. This type of plug will likely find many other useful applications.

The Clark Headlight Dimmer.

The accompanying illustration shows a new diffusing dimmer designed for automobile headlights which effectively prevents glare and at the same time permits of an adequate driving light being projected to the roadway. The Clark dimmer is made of pyraline with an expansible material that fits snugly over the outside rim of the headlight, which holds the dimmer in position regardless of



Clark Automobile Headlight Dimmer.

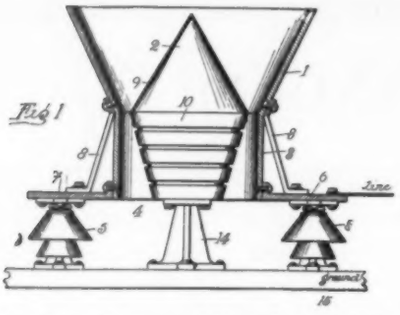
weather conditions. It has a seam through the center which permits of its being collapsed when not in use.

The Clark dimmer is being manufactured by the Cherry-Clark Guard & Dimmer Company, 115 South Dearborn Street, Chicago.

Improved Form of Horn-Gap Lightning Arrester.

The horn-gap lightning arrester is the simplest device of the kind, and on account of its inexpensive and rugged construction is still used very extensively despite its disadvantages. The principal one of these is that when it flashes over to relieve excess potential on the line it discharges not only this excess, but also practically short-circuits the line. This action, although entirely effective in relieving the excess pressure, is needlessly violent and disturbs the continuity of service.

To overcome the disadvantage of this form of arrester and at the same time utilize its simple and rugged features, there has been invented and patented by E. O. Schweitzer



One Form of Improved Horn-Gap Arrester.

and N. J. Conrad, of Chicago, an improved form of horn-gap arrester. The idea in this improvement was to develop means by which the arrester will discharge only the excess pressure and not the line pressure. This is done by providing a series of selective discharge paths of different discharge capacity, those of lower capacity coming into use as soon as the pressure reaches a predetermined excess over the line pressure. The paths of greater discharge capacity come successively into use in case the first path is insufficient to relieve the pressure.

In carrying out this idea a variety of forms of arresters can be developed, one of which is to use a modified horn gap including a series of spark gaps through which the potential is discharged through resistance, the setting of the gap determining the excess of pressure required to cause the discharge and the resistance in the circuit of the gap determining its discharge capacity. Thus the short gap with high resistance in series is adjusted to break down first, the next gap breaks down after this and so on throughout the series.

However, to counteract the tendency to break down and discharge which occurs in the gap adjacent to the one which is discharging, there is provided a powerful blowout arrangement. This is made in two forms, in each of which the arc is compelled to move out and break itself regardless of the rate of discharge at the point of formation. At the same time that the arc moves the current constituting it is caused to decrease.

The manner in which this combined action is produced is by sectionalizing one or both of the electrodes and inserting resistance between the sections; also by depending upon the lengthening of the arc itself between the electrodes. Consequently the arrester has the property of preventing formation of an excess discharge and also of breaking any discharge which does form. It can, therefore, be set at a relatively low value.

A simple form of this arrester which discloses this principle is shown in the accompanying illustration. The outer electrode *1* is funnel-shaped at the top and cylindrical at the bottom. Mounted within it is the grounded electrode *2*, which is of conical form at the top and sectionalized below. Between the sections are inserted resistances of graded value. In other forms of this arrester the lower portion is closed and the upper portion is given various shapes. The blowout arrangement in this case is due to the explosive action of the heated air which drives the arc upward. In the case of the open type, such as shown in Fig. 1, the blowout action is due to powerful convection currents in the chimney-like arrangement of the lower portion of the device. Another advantage of this form of arrester is that it is protected from wind and weather disturbances so that its action is much more reliable and uniform than in the case of the ordinary horn gap commonly used.

These arresters are being developed by the firm of Schweitzer & Conrad, Incorporated, 1770 Berteau Avenue, Chicago, Ill.

Small, Light Fan for Travelers.

For a commercial or professional man that is called upon to travel a great deal, one of the most disagreeable features is to be compelled to put up at a hotel with stuffy rooms. Traveling men need good, sound sleep as much as anyone else, and a compact, light-weight electric fan that can be readily packed in a grip and carried along on the trip promotes such sleep. To meet the need the Fulton-Bell Company, 105 West Fortieth Street, New York City, has developed and marketed a special fan known as the "Little Giant," on account of its power in comparison to its size and weight. Complete with cord and plug it weighs 2.5 pounds. Its blades are 4.5 inches in diameter. It has a universal motor suitable for connection on any lighting circuit of from 110 to 130 volts. The fan is nicely finished and well built. It has speed adjustment, giving ready control of the breeze. Although designed especially for traveling use, it also serves admirably in small confined inclosures, or in providing just enough breeze for one person.

Electric Radiators for Use in Electric Vehicles.

One of the strong points which has made the electric vehicle popular, particularly with lady motorists, is the great comfort attainable in the usually well furnished closed body of the car. While this is itself a protection against the inclemency of the weather, there are times in winter when additional warmth is desirable. A type of electric radiator to meet this requirement has therefore been placed on the market by the Lee Electric Radiator Company, 629 Peoples Gas Building, Chicago. This radiator is of the same general type as the one described in the Electrical Review and Western Electrician November 27, 1915. From external appearance it looks as if it might be a hot-water or steam radiator, but in fact its two coils are filled with an insulating liquid and in the lower portion of the coils the heating element is mounted. This latter is an open coil which, when operating from the 80-volt battery circuit usually provided for electric vehicles, takes about 3.9 amperes and very quickly gives the radiator a temperature of about 190 degrees Fahrenheit.

The radiator is made of cast-iron sections 15 inches high and has three square feet of radiating surface. It is attached to a base plate which can be secured to the floor of the car to insure stability. This outfit is compact and takes up very little room.

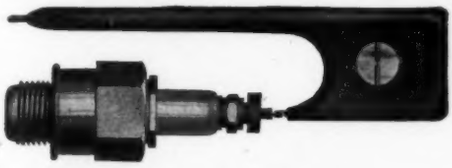
Electric Radiator Keeps Pleasure Car Comfortable.

A New Spark-Plug Tester.

A simple and convenient tester for spark plugs on automobiles, motorboats, motorcycles, etc., is being put out by the Pittsburgh Electric Specialties Company, Pittsburgh, Pa., under the name of the Royal tester.

It consists of a crotch containing the spark gap and two legs containing the terminals. One leg is three inches longer than the other so as to permit of handy contact.

When the plug is good, the tester shows the regular spark. If it is short-circuited, it will show no spark. If the porcelain is defective, the tester will show an irregular



Royal Tester for Spark Plugs.

spark. If the motor has no power, the tester will show a clear spark, indicating that the trouble is in the mixture. When there is a knock in the motor, the tester will magnify the knocking noise and thus locate it.

The tester is made of hard rubber with rounded corners. It is light in weight and only five inches long.

Orr & Lockett Drilhammer.

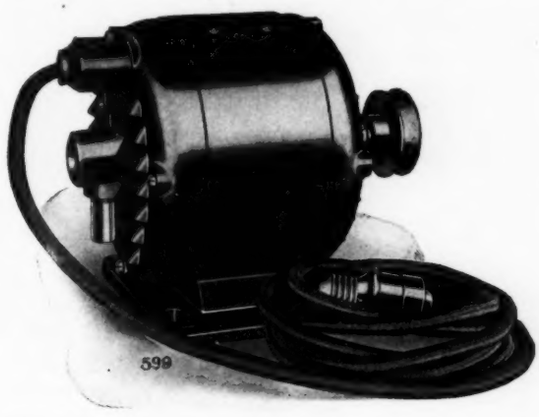
With the renewed activity in electrical construction work throughout the country, the Orr & Lockett Hardware Company, 14 West Randolph Street, Chicago, reports considerable activity in the sales of its Drilhammer, a tool especially designed for electrical contractors for drilling holes in any material except wood and metal. The Drilhammer, which is made in two sizes, is said to effect considerable saving in time over other methods. An extended description of this tool appeared in the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN of January 17, 1914. It has a one-piece malleable handle which when revolved transmits centrifugal force to two hammer elements which deliver upwards of 975 blows per minute upon the drill.

Skeleton View of Drilhammer, Showing Internal Construction.

Washing-Machine Motor Has New Feature.

A new line of motors of special design has been developed by the Robbins & Myers Company, Springfield, O., for washing-machine service.

The end heads of this motor are cast in a form which serves to exclude from the interior any water that may splash on the motor. At the same time a free circulation of air is permitted through the motor, ventilation being assisted by a fan on the motor shaft. The base, which is provided with four holes for fastening the motor to the machine, is cast separately and attached to the motor frame



New Type of Robbins & Myers Washing-Machine Motor.

by four screws. It may be attached to the top of the motor, permitting of overhead mounting without making it necessary to turn the motor over. The motor terminals are protected by an iron box and the reinforced cord enters through a rubber bushing. A grooved pulley is provided. The bearings are made of phosphor bronze and are lubricated by wick oilers, the lubricating system being constructed to prevent any leakage and resultant soiling of clothes.

The motor is manufactured for direct-current lines of standard voltage and for alternating-current lines of standard voltages and frequencies. The rated speed is 1,750 revolutions per minute for the direct-current and 60-cycle alternating-current motors.

Haag Twin Washing Machine.

The use of electric power for driving washing machines relieves the housewife or laundress of the strenuous work involved in washing clothes, thus leaving her free either to engage in other duties, or to do the washing in a more

Haag Twin-Tub Electric Washer.

intensive manner. To develop the latter idea the Haag Brothers Company, of Peoria, Ill., has brought out a new form of washing machine called the Haag twin washer, because it uses two tubs in either or both of which washing may be carried on while clothes are being rinsed, blued and wrung dry.

The two tubs are made of heavy white cedar and are mounted side by side on a strong steel framework with a folding extension rack for holding a clothes basket and rinsing or bluing tub. Each of the twin tubs can be drained through hose connection. Each tub has a separate control connection with the motor drive so that it can be operated independently or with the other. The covers are also so arranged that, if desired, closing of either cover starts the washing operation in the corresponding tub. The wringer is separately controlled and easily reversed, it can be swung into any desired position and locked in place. A one-fourth-horsepower Robbins & Myers motor supplies all the power. It is mounted under the machine so that it is well protected from injury.

This washer is substantially built in every particular and is designed primarily for heavy service. Its use doubly facilitates handling a large batch of clothes.

Anderson Charging Receptacle and Plugs for Electric Garages.

Some time ago it was realized by the electric-vehicle interests that in order to increase the facility of charging the

Anderson Charging Receptacle for Electric Vehicles.

batteries of electric pleasure and commercial cars it would be necessary to standardize a form of charging receptacle and plug so that a vehicle could run into any garage provided with charging facilities and secure either a complete or boosting charge. Standard specification governing the dimensions of such receptacles and plugs was therefore drawn up by a committee of the Electric Vehicle Association of America and the Electric Vehicle Committee of Great Britain also adopted these specifications.

The standard specifications chosen were those employed in the type of charging receptacle and plug manufactured by the Albert & J. M. Anderson Manufacturing Company, Boston, Mass. The wisdom of this selection has been borne out by the uniformly satisfactory results obtained from the use of these plugs and receptacles. Their design meets both the mechanical and electrical requirements for a device of this kind, which must withstand severe service on the part of truck and garage attendants. The form of receptacles provided on vehicles is shown in Fig. 1, wherein there is an iron clamp, by means of which the device is mounted on the body of the car. A spring lid, shown open in the cut, is mounted on front to protect the terminal contacts from moisture, dust and dirt. The shell of the receptacle is a seamless drawn-steel housing, which thoroughly protects the current-carrying parts, which are securely mounted within it and carefully insulated by means of a compound possessing special heat-resisting properties. The shell forms a bearing for the correponding steel shell of the plug, Fig. 2, and thereby relieves all contact parts of mechanical strain. Special terminal lugs provide connection with the connecting cable. A unique feature of these receptacles and plugs is that they are positively polarized so that it is impossible to connect the vehicle battery in the wrong direction.

The connecting cable used between the vehicle and the garage or other charging outlet is provided with a plug at each end. This fits into the vehicle receptacle, Fig. 1, at one end, and at the other end into the permanent receptacle forming the charging-circuit outlet. This latter receptacle is of similar standard design, at least as far as the contacts are concerned, but is arranged to be mounted in several different ways. One of these is by means of a ball-and-socket joint, which permits not only more convenient arrangement of the cable without excessive bending, but has another advantage in that it permits automatic instant disconnection of the connecting cable from the charging receptacle without damage to any part in case the vehicle should be started up without first disconnecting the cable. Another form of the garage receptacle is arranged for mounting on the ceiling. In this case a ball-and-socket arrangement is also used. These receptacles are also made for switchboard mounting or for mounting outdoors.

These battery-charging receptacles are being used very extensively in all the most up-to-date electric garages. A noteworthy installation thereof recently completed is in the electric truck garage of the Stroh Brewery Company, Detroit, Mich., which was described and illustrated in our issue of January 1, 1916.

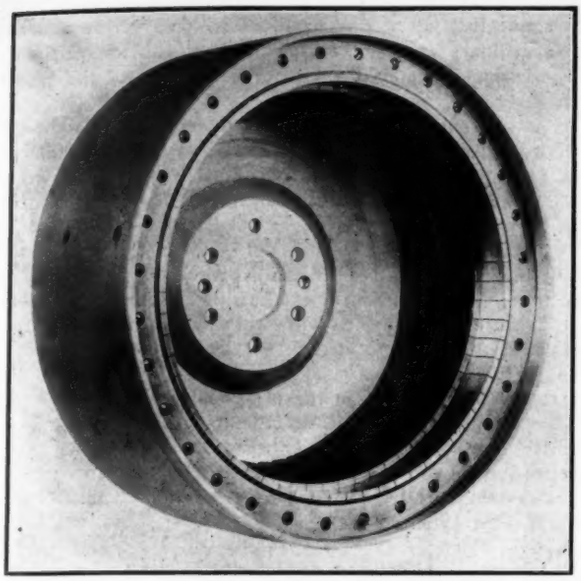
Plug at End of Charging Cable.

Star Electric Fans.

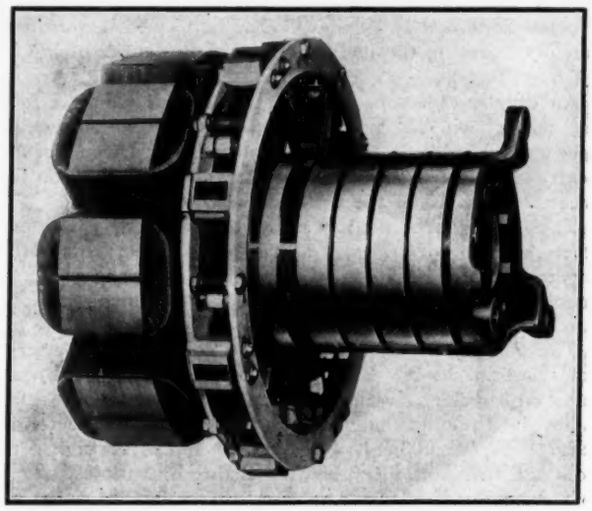
A line of pressed-steel direct-current fans is now being marketed by the Fullerton Electric Company, 109-115 West Twenty-sixth Street, New York City. These are known as the Star fans, and are made in 12 and 16-inch desk and bracket types, both non-oscillating and oscillating. The voltage is 110 to 115 or 200 to 240. A ready change of angle and manner of mounting is obtained by the swivel and trunnion adjustments. The oscillators have a carefully designed oscillating gear mechanism provided with safeguards to prevent overturning the outfit or burning out the motor in case obstructions are met with. The oscillation is readily adjustable.

Vesta Centrifugal Electric Power Transmission for Automobiles.

The announcement by the Vesta Accumulator Company, 2100 Indiana Avenue, Chicago, of its centrifugal electric power transmission comes at a very opportune time, as it is generally admitted by automobile engineers that the electric transmission will supplant the old methods in the future cars. This firm has been working for a number of years in developing a transmission system which has been designed by William Morrison. A number of cars have been equipped with this transmission, one of which has been used for nearly four years. The main difference in the Vesta transmission as compared with other electric transmissions



Flywheel Armature of Vesta Electric Power Transmission for Automobiles.



Revolving Field and Centrifugal Brush Which Fits Inside of Armature and Commutator.

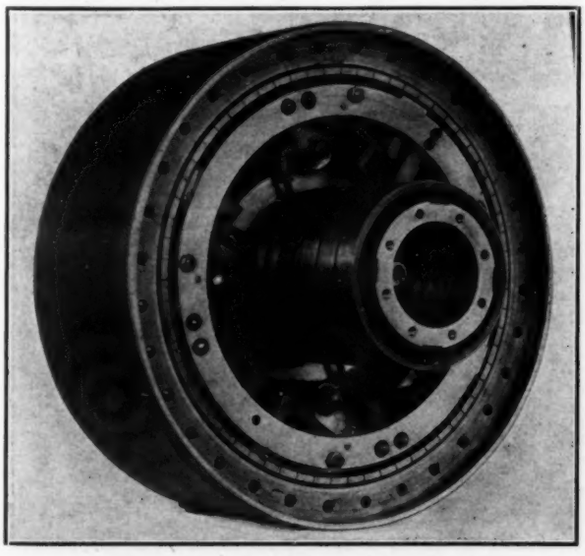
is that it does not transfer its energy with the exception of the small amount used for cranking the engine and lighting the lamps.

Centrifugal force is the important factor depended on for efficiency and economy in operation, as well as acting as an automatic regulator for the generator system. It is claimed that it totally prevents any danger of burning out the armature or fields regardless of the length of time in operation, even under the most adverse road conditions. It is also said to act as a perfect regulator for the battery system, preventing injury to the battery under the most adverse conditions.

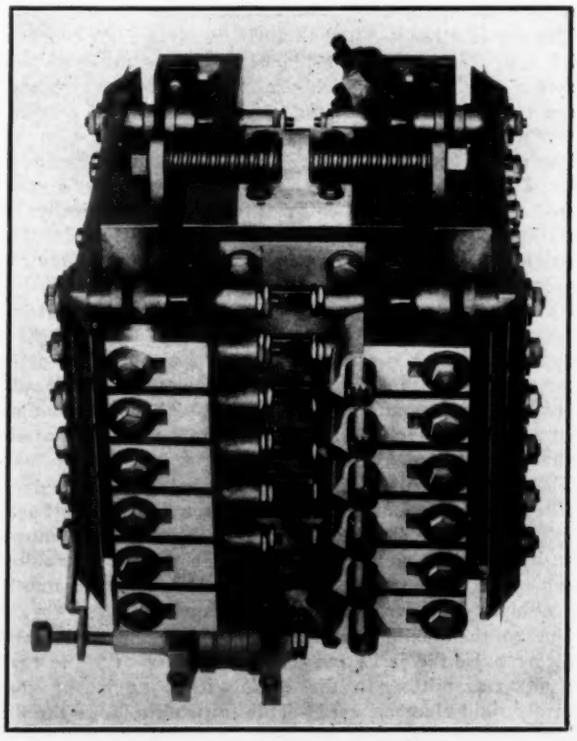
The equipment consists of two main parts, the armature and the fields. Unlike the average motor or dynamo, the fields are on the inside and the armature on the outside. The armature is the flywheel itself and is bolted direct to the flange on the crank shaft of the engine. The flywheel armature is in the shape of a drum in which are mounted the armature laminations and form windings. There is used an internal commutator which is fastened to the outer edge of the armature drum. The fields are fastened to the propellor shaft and are mounted inside the armature on the crank-shaft extension, and rotate freely on roller bearings.

The brushes, which are a part of the field unit, press outwardly against the face of the internal commutator. When the car is running, these brushes exert pressure against the commutator, due to centrifugal force so that when the car has reached a speed of 15 miles or more, driving on a level roadway, the force is sufficiently great to prevent any slip between the fields and armature. This centrifugal force can be governed by weighting the brushes themselves to the desired amount.

With this construction, one can readily see that great flexibility can be obtained in starting the car or on the pick-ups, and as the car increases in speed, the greater the centrifugal force the less the chance of slip. The slip that occurs in starting is not wasted but is used to generate electricity to charge the battery, keeping it in a fully



Flywheel Armature and Field Assembled.



Series-Parallel Switch Group of Controller.

charged condition at all times. The battery in this system actually floats on the line, there being no danger of injury by overcharging.

An excellent demonstration of the centrifugal-force factor was shown in demonstrating this system. When a speed of 20 miles an hour was reached, the driver disconnected all electric circuits, and at will maintained or increased the speed of the car from that point on.

The operation of the car is extremely simple. The car starts in high, goes through all ranges of speed, from nothing to the highest speed of the car by simply feeding it gasoline, the electrical and centrifugal action being entirely automatic with the fuel feed.

The pushing of the starter button connects the battery, fields and armature. The fields are held stationary by an automatic locking arrangement and the flywheel armature is revolved around them. This automatic locking arrangement does not make it necessary to apply the brakes to hold the field stationary in the starting operation.

The operation of the "gas" lever or accelerator makes an electrical connection automatically between the battery, fields and armature so that when the throttle is advanced, the internal fields immediately try to catch up with the revolving armature, through magnetic pull, assisted by the increasing centrifugal force.

Owing to the extreme flexibility of this device, it is impossible to stall the motor. When the gas throttle is fully retarded, all electric connections are broken and the car coasts until it stops by itself unless the brakes are applied.

The controller is a simple parallel and series switch mechanism operated electrically and is entirely automatic with the gas feed. The pushing of the starter button operates the series side of the controller, causing the batteries to be thrown in series to a 24-volt, 50-ampere-hour connection. the operation of the gas throttle or accelerator, automatically causes the other, or multiple side of the controller to regroup the batteries to a parallel or 6-volt, 200-ampere-hour connection. The construction of the controller makes it impossible to close both series and parallel circuits at the same time. The starting of the car, as well as the speed, is entirely regulated by the feeding of the gasoline, the electric connection being entirely automatic.

The use of electric motors has demonstrated the wonderful life of this kind of machinery. In tests made on this system, the brushes, which are 2.5 inches long, showed three sixty-fourths-inch wear on a car that had traveled 12,000 miles.

For reversing the car, as well as in emergency cases, such as pulling out of a ditch, etc., an ingenious electric compound system is used, which is operated electrically by push buttons on the steering wheel column. This is done absolutely without shifting any gears, and any amount of torque desired can be given.

As over 95 per cent of all running, as well as starting of the car, is done in direct drive, the Vesta engineers feel that only one low speed is necessary. They also show a car equipped with a direct speed and two selective speeds, all of which compound one on another. This compounding allows many times the torque that is possible to attain with the selective system of gears.

These low speeds can be selected and compounded on the reverse, which of course gives as many speeds backward as forward. In demonstrating the car it was shown that by simply touching a button one can go from low speed to high, as well as from high to low speed, instantly and without any jar, noise or vibration.

Due to the flexible connection between the engine and the rear axle, the jerks caused by traveling over the road are not transmitted to the engine itself as is the case where a rigid clutch is used. This feature prolongs the life of the engine itself.

The explosions in the cylinders coming against flexible connection are not transmitted with so severe a shock as in ordinary construction. This results in longer life to the wearing parts of the entire mechanism of the whole car, including the tires.

It is the belief of the Vesta engineers that, weight for weight and running over a given roadway, greater mileage will be obtained per gallon of gasoline than with any other system known. It has also been noted that on a car that has been driven 6,000 miles, equipped with Silvertown cord tires, there was no appreciable difference in the wear of the front and rear tires, as indicated by the small grooves in the tires, the tires themselves showing practically no wear.

It is also interesting to know that in weight, this system supplants the parts eliminated thereby, adding no additional weight to the car, and that its cost just about offsets the parts that it supplants in the old construction.

The intention of the Vesta Accumulator Company is to furnish this system to the entire automobile industry, or license its use to such manufacturers who wish to adopt it. This system is fully protected by a series of United States and foreign patents.

New Electric Sign Makes Use of Illuminated Convex Reflectors.

The value of illumination as a medium for attracting attention, and the use of electricity for purposes of illumination, is now so well recognized that the spirit of the modern city has come to be gauged as much by the effectiveness of its lighting system as by the character of its buildings and streets.

One of the newest applications of electrical energy to advertising is that brought out by the Economy Electric Sign Company. This company is manufacturing a patented electric sign made up of illuminated convex reflectors. Designs are worked out in tin, and by means of punchings, which are made convex and retained in the sign as reflectors, any portion of the design may be brought out by illumination, electric lamps being so placed as to reflect the light from the reflectors in a direction vertical to the sign. Besides economy of operation, in large signs, it is claimed that small and intricate designs may be easily worked out and illuminated.

The Economy Electric Sign Company has established offices at 1725 Michigan Avenue, Chicago, Ill.

New Type of Electric Sign in Store Window.

INDUSTRY ACTIVITIES

A. F. Daum, Pittsburgh, Pa., has issued Bulletin H-18, which is a price list of Daum Types "B" and "E," and midget fuses, fuse strips and refillable plug fuses.

Roller-Smith Company, New York, N. Y., has prepared a folder showing an oscillograph record of one of its 80-ampere circuit-breakers opening a 575-volt circuit at 3,310 amperes.

The Campbell Electric Company, manufacturer of electrical time switches and appliances, Lynn, Mass., has completed plans for a six-story addition, 110 by 50 feet, to its manufacturing plant.

Westinghouse, Church, Kerr & Company, engineers and constructors, New York, have issued a neat four-page booklet which illustrates some reinforced concrete work recently completed by that company.

The Emerson Electric Manufacturing Company, St. Louis, Mo., has issued the February number of *The Emerson Monthly*, which is devoted to descriptive matter about Emerson fans and motor applications.

Dossert & Company, New York, N. Y., announce that the Delta Star Electric Company, Chicago, has ceased to act as its representative and for the present the former company will not establish an agency in that city.

The Century Electric Company, St. Louis, Mo., has prepared a four-page folder illustrating the installation of its line of single-phase motors for duty where a minimum of attention is paid to the machines, being either controlled automatically or from a distance.

The Cutler-Hammer Manufacturing Company, Milwaukee, Wis., is distributing a four-page folder telling of the increases in lifting capacities of its high-duty magnets and illustrating some of the applications of industrial motor control apparatus manufactured by the company.

The Robbins & Myers Company, Springfield, O., is sending out a folder giving information on its line of dealer fan-selling helps. A striking window display cut-out is illustrated. The company has also issued illustrated price lists in booklet form for its lines of fans with drawn-steel frames and with cast-iron frames.

The Wagner Electric Manufacturing Company, St. Louis, Mo., announces the opening of a new office in the Mills Building, El Paso, Tex., with F. B. Hitchings as local manager. This new office is under the supervision of O. H. Davidson, district manager of the Wagner company, whose headquarters are in Denver, Colo.

Utility Company Gives Employees Life Insurance.—The Arkansas Light & Power Company, of Arkadelphia, which operates lighting and water systems in eleven Arkansas towns, presented every employee, from office boy up, with a life insurance policy in a leading company, with a face value of $1,000. There are 78 on the payroll, all of them receiving policies.

General Insulate Company, 1008 Atlantic Avenue, Brooklyn, N. Y., manufacturers of "Insulate" and "Hi-Heat" specialties for electrical, automobile and other purposes, report the year just closed has been, in volume of sales and net results, one of the best in the company's history. Present business indicates to the company's officials that 1916 will be a still better year.

The Snyder Electric Furnace Company, 53 West Jackson Boulevard, Chicago, Ill., which established a European agency at Old Bank Chambers, Bradford, Yorkshire, England, G. J. Stock in charge, reports that the first year of the foreign office has been a successful one. Contracts have been closed for a large number of Snyder furnaces for steel works and for special smelting work.

The Bearing Company of America.—John W. Hertzler, for several years western representative of the Bearing Company of America, has been appointed assistant manager and is now located at the company's factory in Lancaster, Pa. Mr. Hertzler has been succeeded at the Detroit office by William C. Little, who has represented the Buda Company and Brandenburg & Company in the Detroit territory for some years.

The Franklin Electric Manufacturing Company, Hartford, Conn., has revived Benjamin Franklin's famous publication and is issuing what is called *Poor Richard's New Almanack*. It is an eight-page booklet printed on old-time paper and illustrated with woodcut pictures characteristic of Franklin's time. The sayings of Poor Richard are interesting and quaint in their humor. The *Almanack* will be distributed monthly among customers and prospects of the Franklin company.

Westinghouse Electric & Manufacturing Company.—The Veteran Employees' Association at a banquet held January 29 in the Fort Pitt Hotel, Pittsburgh, presented to the company a handsome bronze memorial tablet of the late George Westinghouse, founder of the numerous industries bearing his name. The tablet is 4 feet by 3 feet, and shows a bas-relief likeness of Mr. Westinghouse, under which is the inscription, "George Westinghouse, Master Workman, Inventor, Founder, Organizer, 1846-1914." It will be placed in the reception room of the East Pittsburgh works of the company.

Coking and Electric Power Generation to be Combined.—A project has been under consideration in Pennsylvania by which a company was to be formed to establish a coking plant in a new location, selling its by-product of gas to another company that would generate electric power from it, this concern to distribute the current through a certain part of Pennsylvania and to enter into particular contractual arrangements with an important railway that would thus obtain power for a contemplated mountain electrification much more cheaply than it could itself generate, at the same time saving the cost of capital necessary for its own power houses.

The Sprague Electric Works of General Electric Company, New York City, is making no radical changes in its extensive line of direct-current fans which have been manufactured for some 24 years. There is being added, however, a complete assortment of nine-inch fans which therefore makes the line more complete than ever and provides a suitable type of fan for practically every requirement. A number of refinements in design and construction have been incorporated in the 1916 line. This company's well known Sprague-Lundell fan motor still retains its distinctive feature of the single field coil which energizes both poles and thereby obtains exceptional simplicity. The oscillating mechanism of fans of this type is detachable and can be added to all 12-inch and 16-inch non-oscillating fans that have been manufactured by this company since 1908. To add this mechanism requires only about five minutes' work and the use of only a screw driver.

LATEST APPROVED FITTINGS

The electrical fittings illustrated and described in this department have been approved by the Underwriters' Laboratories, Incorporated, following examination and tests conducted under standards of the National Electrical Code as recommended by the National Fire Protection Association

ARMORED CABLE AND CORD.—Trumbull Electric Manufacturing Company, Plainville, Conn.

Marking: Trade-mark (Circle T), stamped every 2.5 inches on exterior of armor.

Listed December 20, 1915.

AUTO STARTERS.—Crocker-Wheeler Company, Ampere, N. J.

Oil-immersed switch and air-cooled transformer mounted as a unit in metal case, with no-voltage-release coils and with or without overload release devices. Two and three-phase starters; capacity 200 horsepower or less, 600 volts or less; types CX, DX, EX, FX.

Oil-immersed switch mounted in metal case, with no-voltage-release coils and with or without overload release devices. Three-phase star-delta starters whereby motor windings are star or delta-connected during starting and delta-connected when running; capacity 30 horsepower or less, 600 volts or less; type BX.

Both types are used as a means whereby potential impressed on alternating-current motor windings may be made less than full line voltage.

In off position motor and transformer windings, where used, are disconnected from line. Overload release is inoperative during process of starting motor, and other circuit-breakers or fuses are necessary in motor circuit.

Listed December 23, 1915.

FUSELESS ATTACHMENT PLUGS.—The Bryant Electric Company, Bridgeport, Conn.

Bryant or Perkins, "Spartan." 660 watts, 250 volts, catalog No. 700.

Listed December 30, 1915.

FUSES, Cartridge Enclosed.—Multi-Refillable Fuse Company, 723 Fulton Street, Chicago, Ill.

Multi non-refillable cartridge inclosed fuses. 0-600 amperes, 250 volts.

Listed December 29, 1915.

GROUND CLAMPS.—The Ohio Electric & Manufacturing Company, 5016 Woodlawn Avenue, Cleveland, O.

Ground clamp for use with No. 10 B. & S. gauge ground wire. A single-piece clamp of tinned copper, provided with suitably spaced holes and with copper-plated bolt, nut and washer for clamping to rigid conduit. Adjustable for use with conduit up to and including one-inch in size. One end of clamp is channeled to form equivalent of a lug for soldering to ground wire.

Listed December 6, 1915.

HEATERS, Electric.—Rathbone Manufacturing Company, Grand Rapids, Mich.

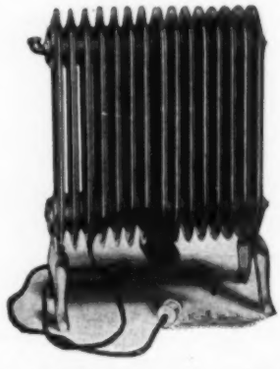
Electric air-circulating radiator. This device consists of cylindrical heating element, supported horizontally and inclosed in bottom of sheet-metal radiator made up of series of vertical radiating members, 660 watts, 110 volts.

Electric hot-water-circulating radiator. This device consists of two cylindrical heating elements supported vertically in center radiating member and inclosed in watertight tube, 660 watts, 110 volts.

Listed December 23, 1915.

INDIVIDUAL VEHICLE BATTERY-CHARGING EQUIPMENT.—Fort Wayne Electric Works of General Electric Company, Fort Wayne, Ind.

An individual vehicle battery charger consisting of a motor-generator and a special control panel permitting starting of set from battery before connecting A. C. motor to line. For use on 110, 220, 440, or 550 volts A. C.



Electric Hot-Water Radiator.—Rathbone Manufacturing Company.

Listed January 12, 1916.

MOTOR - OPERATED APPLIANCES.—The Hertner Electric & Manufacturing Company, Cleveland, Ohio.

A vertical battery charger and operating panel consisting of a vertical motor-generator and a cabinet inclosing a panel with switch, cartridge inclosed fuses and base, and a field control rheostat.

Listed December 30, 1915.

OUTLET BUSHING AND FITTING.—Cap-Swivel-Let Company, Warren, R. I.

Johnson's Cap-Swivel-Let conduit bushing consisting of porcelain cap with wire openings held in sheet-metal plate and secured to conduit by a cast swivel nut, formed with a lug for securing a ground wire. In sizes for standard ½, ¾, and 1-inch rigid, iron conduit.

Standard for use only at an exposed end of conduit (but not under fixture canopies) and only where conduit wires pass out through fitting without splice, joint or tap within fitting.

Listed December 1, 1915.

OUTLET BUSHINGS AND FITTINGS, Couplings, Elbows and Tees.—Thomas & Betts Company, 105 Hudson Street, New York, N. Y.

Brass floor couplings with threaded brass plugs; and malleable-iron bushed elbows and bulb tees, with bushed inlets for threaded conduit and threaded outlets at the top for brass floor couplings. No. T. & B. ¾-inch to 1¼-inch sizes.

Standard for use in concrete floors for coupling short lengths of exposed conduit to concealed conduit systems when so installed that floor couplings do not come below surface of floor in which they are embedded and subject to following restrictions: Bushed elbows to be used only where conduit wires pass through fitting without splice, joint or tap within fitting, and only where no more than one bushed elbow is used in any conduit run. Bulb tees to be used only where conductors are not drawn in until after the main conduit installation is complete. If splices, joints or taps are used in bulb tees, conductors must be so looped that upon removing exposed conduit at floor coupling, splices, joints or taps can readily be disconnected without interfering with other wiring within fitting.

Listed December 26, 1915.

OUTLET BUSHINGS. — Weber Manufacturing Company, 633 South Main Street, Wilkes-Barre, Pa.

Connector bushings of pressed steel for connecting armored cable or flexible conduits at outlets.

Listed December 1, 1915.

PHOTOGRAPHIC PRINTING MACHINE.—Burke & James, Inc., 240-258 East Ontario Street, Chicago, Ill.

Device for printing photographs by incandescent lamps. A wood light chamber supports a special printing frame and contains lamp receptacles and metal-inclosed control switch and wiring. Equipment includes portable cord with separable attachment plug for connection to supply circuit. Ingento 240 watts, 250 volts.

Listed January 5, 1916.

PICTURE MACHINES AND APPLIANCES.—Baird Motion Picture Machine Company, 31 Runyon Street, Newark, N. J.

Baird motion-picture machine. Two types; one for hand operation, the other driven by a special motor equipped with a mechanical speed controller and inclosed in a metal compartment.

Listed January 12, 1916.

PERSONAL AND BIOGRAPHICAL

MR. M. N. WEEKS, who has been manager of the Grand Rapids (Wis.) Electric Company for a number of years, has resigned to enter the construction business.

MR. F. W. LOVETT has succeeded MR. H. K. MUDD as editor of *Wire and Pipe*, the monthly publication of the Union Electric Light & Power Company, St. Louis, Mo.

MR. F. W. FRUEAUFF, of New York City, formerly vice-president of the City Light & Traction Company, Sedalia, Mo., has been elected president of that company succeeding MR. H. L. DOHERTY.

MR. ATTILLA NORMAN, general manager of the Oregon Power Company, has been appointed official delegate of the Eugene (Ore.) Commercial Club to the Chamber of Commerce of the United States.

MR. C. E. FAHRNEY, manager of the Ottumwa Railway & Light Company, has been appointed a member of the Commercial Association Committee which is arranging for an annual county fair in Ottumwa, Iowa.

DR. DAVID SNEDDEN, Commissioner of Education of Massachusetts and a member of the Board of State Examiners of Electricians, has resigned from office and will become a member of the faculty of Columbia University.

MR. CARL A. SYLVESTER, formerly general manager of the Middlesex & Boston Street Railway in Massachusetts and now general manager of the electric railway system of Rio Janeiro, Brazil, was married January 20 to Miss Lillian F. Harrington, of Newton, Mass., at Grace Episcopal Church in that city.

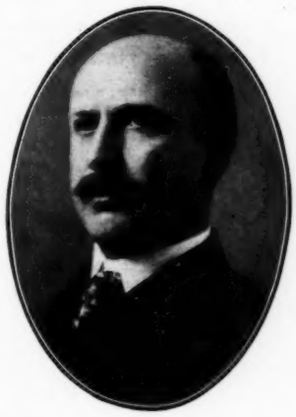
MR. FRANK S. KRUG, city engineer of Cincinnati, has been chosen administrative head of the proposed Cincinnati Rapid Transit & Interurban Railway project by the Rapid Transit Commission of that city. Mr. Krug will also be chief engineer of the commission and will have charge of the construction of the street-railway project if bonds for that purpose are issued.

DR. GEORGE D. SHEPARDSON, head of the Electrical Engineering Department, University of Minnesota, will be the guest of honor at a dinner given by his former students at the Hotel Radisson, Minneapolis, February 12. The dinner will be given to celebrate the closing of the twenty-fifth year of continuous service by Dr. Shepardson as head of the Electrical Engineering Department.

MR. GEORGE C. KNOTT, formerly manager of the Benjamin Electric Manufacturing Company of Canada, Toronto, has become associated with the Wirt Electric Specialty Company, Philadelphia, Pa. Under Mr. Knott's able management the business of the Benjamin company was greatly increased, and he will leave a host of friends on the Canadian side who wish him success in his new business undertaking.

MR. CHARLES H. GAUNT, general manager of the Pacific Division of the Western Union Telegraph Company, San Francisco, Cal., was tendered a farewell banquet at the Bohemian Club prior to his departure for Chicago, where he will assume the duties of general manager of the Western Division of the company.

MR. HARRY A. NICHOLL, who was awarded a silver replica of the Anthony N. Brady Memorial Medal at the annual meeting of the American Museum of Safety in New York City February 3, is general manager of the Union Traction Company, Anderson, Ind. The jury of awards presented the medal to the American electric railway company which for the year of the award shall have done most to conserve the safety and health of the public and of its employees. A replica in bronze was presented to MR. J. E. HANCOCK, a motorman of the



Harry A. Nicholl.

Union Traction Company. The award is a pleasant expression of the appreciation of the efficient and careful methods employed by Mr. Nicholl in his capacity as general manager of the company.

MR. F. J. ALLEN, who has been connected with the Benjamin Electric Manufacturing Company for several years, has been appointed manager of the Canadian branch of the same company at Toronto. Mr. Allen's experience with the Benjamin company has placed him in close touch with the many phases of the company's business organization, and under his direction continued success for the Canadian branch is assured.

MR. EMERSON McMILLIN, chairman of the board of directors of the American Light & Traction Company, has founded two scholarships in the new school of engineering of the University of Detroit, the scholarships to be awarded by the faculty of the school. Mr. McMillin's interest in the school is stimulated by the fact that the industries controlled by his company are large employers of electrical, mechanical and civil engineers and his purpose is to promote opportunities for young men of Detroit and vicinity in that direction.

MR. WILLIAM H. BYARS, of the Ne Page-McKenny Company, Seattle, Wash., has been instrumental in forming an organization of the representatives of the various companies engaged in the electrical industry in Seattle. Questions concerning electrical development and appliances will be discussed at monthly meetings. MR. A. M. JONES, of J. A. Roebling's Sons, MR. ROY WORTH, of the Pacific States Electric Company and MR. H. J. GILLE, of the Puget Sound Traction, Light & Power Company, also assisted in forming the organization, for which a name has not yet been selected.

MR. CHARLES HAYDEN was recently elected president of the Nassau (N. Y.) Light & Power Company, the holdings of the company having been sold to the firm of Hayden, Stone & Company, New York, N. Y. The Nassau Light & Power Company does all the electric light and power business in that portion of Long Island which includes the principal residential districts of Roslyn, Westbury, Glen Cove, Oyster Bay and neighboring towns. A more progressive and aggressive policy of enlarging the facilities and developing the business of the company is expected to be inaugurated under Mr. Hayden's supervision.

MR. H. M. BYLLESBY, of H. M. Byllesby & Company, Chicago, Ill., was guest of honor at a luncheon given by MR. LOUIS W. HILL, president of the Great Northern Railway, at the Minnesota Club, St. Paul, January 26. About 150 men prominent in business, professional and public life were present. In talks by Mr. Hill and others the construction work and progressive methods of the Byllesby organization were praised, and particularly complimentary remarks were made in reference to the efforts of MR. P. T. GLIDDEN, St. Paul manager of the Byllesby properties, which were cited as an example of what modern management should be to be permanently successful.

OBITUARY.

DR. JOHN O. REED, a prominent member of the University of Michigan faculty from 1892 to 1914, died in Cleveland, O., January 22, aged 60 years. He was the author of many well known text books on physics.

MR. CLARENCE A. HENLEY, who had been connected with the McGraw Publishing Company, Inc., New York City, for several years as a member of the business staff of the *Electric Railway Journal*, died February 1 as a result of injuries received in an automobile accident on January 29. Mr. Henley was 24 years old.

CURRENT ELECTRICAL NEWS

Weekly Record of Construction Activities

EASTERN STATES.

MIDDLEBURY, VT.—The Public Service Commission will hold a hearing here February 24 on a petition to acquire the water rights in Addison County for generating energy for power, heat and light. The incorporators of the company, to be known as the Central Power Corporation of Vermont, seeking the rights are C. H. Thompson, H. J. M. Jones, B. A. Summer and D. J. Lillie, all of Montpelier, Vt.; F. H. Stuart and A. T. Stuart, Newton, Mass., and Alexander Gordon, Barre, Vt. The company wishes to acquire water rights on Middlebury River and its branches in the towns of Middlebury and Ripton; construct and operate power plants, pipe lines, auxiliary steam plants and stations in Barre, and construct the necessary transmission lines to distribute electricity in the following towns: Middlebury, Ripton, Lincoln, Hancock and Granville, in Addison County; Warren, Roxbury, Northfield, Berlin, Barre, and Montpelier, in Washington County, and Williamstown in Orange County. The proposed office of the corporation is Middlebury and the capital stock $1,000,000.

LAWRENCE, MASS.—Mayor Hurley has been petitioned by interested citizens to make plans for a white way on Broadway, Essex Street and other parts of the city. It is planned to have the system completed in July.

SALEM, MASS.—The Street Lighting Committee is considering improvements in lighting, both on the streets and in the interior of the public buildings of this city. A white way system is being planned.

TAUNTON, MASS.—Improvements in the municipal generating station and the reconstruction of lines in the city are contemplated.

TORRINGTON, CONN.—The American Brass Company is contemplating the erection of a large power plant in connection with the factory of the Coe Brass branch here.

ALBANY, N. Y.—The Public Service Commission has authorized the issue of $546,000 of 6-per-cent three-year gold notes, dated February 1, 1916, by the Salmon River Power Company with which the company will complete the financing of its 30,000-horsepower hydroelectric plant on the Salmon River, Oswego County, from which it proposes to supply current to the Solvay substation of the Niagara-Lockport Ontario Power Company.

BINGHAMTON, N. Y.—Plans have been approved by the Western Union Telegraph Company to place underground all of its wires and cables extending from Liberty Street on the east to Front Street on the west along the railroad tracks, and from this territory to the local office at State and Henry Streets. H. F. Horton is manager.

PARISHVILLE, N. Y.—The electric light plant here was destroyed by fire recently. The plant will be rebuilt.

CAMDEN, N. J.—In order to secure a white way the mayor has been authorized to make a supplementary contract with the Public Service Electric Company for the installation of 50 arc lamps on Broadway, wiring to be placed in underground conduit.

HACKETTSTOWN, N. J.—The Hackettstown Electric Light Company is seeking a 50-year franchise giving the company the right to construct power lines from the city to Belvidere, through the villages of Vienna and Great Meadows, to furnish energy for light and power to private customers and for lighting the streets in Vienna and Great Meadows.

MILLVILLE, N. J.—As a result of the refusal of the City Commission to grant the Millville Electric Light Company an extension of time in which to complete the street lighting system, a resolution was adopted to submit a referendum to the voters on the question of a municipal electric light plant.

NEW CASTLE, PA.—A high tension power line will be constructed in this industrial district by the Mahoning & Shenango Valley Railway & Light Company, the line to connect the company's million-dollar plant at Lowellville, O., with the plant at Ellwood City. Steel pyramid towers, 60 feet in height, and erected at intervals of 500 feet, will be constructed over the entire right of way, which has recently been secured. The towns and industrial centers between Ellwood and Lowellville, including New Castle and the large manufacturing plants here, will be supplied from the new line when it is placed in operation. These places are now supplied by the corporation which will erect the new transmission line.

NEW HAMILTON, PA.—A municipal light plant and trolley line between this city and the works of the Aetna Explosive Company was assured at a public meeting here when the first $1,000 was subscribed toward the capital necessary for the improvements. J. W. White, superintendent of the Aetna Works, pledged his company to take up one-half of the capital stock issued to build and equip the trolley line.

GRANITE FALLS, N. C.—The Ivey Power Company, E. C. Ivey, manager, Lenoir, N. C., will build a hydroelectric plant on Gunpowder Creek, near Granite Falls.

HILLSBORO, N. C.—The Hillsboro Power & Light Company has been incorporated with a capital of $7,500 by S. M. Gattis and others.

IVA, S. C.—The city contemplates the construction of an electric light system. H. A. Orr, manager of the local branch of the Southern Public Utilities Company, will submit a proposition to furnish electrical energy for such a purpose.

SALUDA, S. C.—F. A. Hugh, of Atlanta, Ga., has secured a 20-year franchise to build an electric light and power plant to cost $6,000.

ACWORTH, GA.—The Council is planning to install a $7,000 electric light system. P. O. McLain is city clerk.

ATLANTA, GA.—Application has been made for a franchise in Atlanta for a suburban electric railway, to be constructed between Atlanta and Creighton, Ga., a distance of 60 miles. The franchise is asked by the Federal Construction Company.

NORTH CENTRAL STATES.

AKRON, O.—The Northern Ohio Traction & Light Company is planning to triple the present capacity of its power plant at the Gorge. Additions to the plant will be made with a view of taking care of the company's increase of business for several years to come.

CANTON, O.—A boulevard lighting system for the center of the city is desired by the authorities, who are investigating various types of lights. The Canton Electric Company and other local light concerns will assist in the investigations by showing samples of lights in actual service.

CINCINNATI, O.—The Cincinnati Gas & Electric Company and the Union Gas & Electric Company at a conference held last week arrived at an agreement regarding the financing of the new power station to be constructed on the river front at Cincinnati. The cost of the plant will be covered by $4,000,000 of a proposed issue of $15,000,000 of bonds of the Cincinnati Gas & Electric Company and the Union Gas & Electric Company will guarantee the payment of interest on the bonds issued for that purpose. The plant is to have a capacity of not less than 50,000 kilowatts, and additional units will be provided for if necessary. It is the intention of the companies to provide sufficient current for the use of all of the electric and traction companies in and around Cincinnati for years to come.

CLEVELAND, O.—Improvements costing $2,000,000 will be made during 1916 by the Cleveland Electric Illuminating Company, according to a statement by Samuel Scovil, president of the company.

DAYTON, O.—A new two-story factory building of steel and concrete, equipped with electric elevators, machine motors and other electrical devices, will be constructed by the Miami Brass Foundry Company, of which B. Semmelman is president.

DAYTON, O.—The Dayton Power & Light Company, of which O. H. Hutchings is superintendent, has plans and is taking bids on building a two-story brick and reinforced concrete building, together with radial brick stacks, steel towers, etc., the cost of which is to be $1,000,000.

DELPHOS, O.—Contracts have been signed by the Northwestern Ohio Light Company for the electrification of the entire plant of the Delphos Manufacturing Company. The necessary equipment will cost about $30,000.

EAST LIVERPOOL, O.—An ordinance has been passed extending to the East Liverpool Traction & Light Company the right to build a new Grandview car line and complete other contemplated improvements to the company's holdings in this city.

HICKSVILLE, O.—The Hicksville Electric Light Company, which now furnishes energy for lighting ten neighboring towns, will also supply the town of Ney. C. M. Lott, the owner of the company, is adding new equipment to plant to carry the increased load. There is some prospect that this city will replace its arc light system with lighting standards of the cluster or one-light type. The City Council and the lighting company are working out the details for the addition of this improvement, which has the support of Hicksville citizens.

MARION, O.—Steps are being taken preliminary to the construction of an electric trolley line connecting this city with Mt. Gilead. The proposed line will cut down the traveling distance between these two points.

OSNABURG, O.—The business men of Osnaburg and residents of the road between Canton and Osnaburg are planning to organize for the purpose of securing franchises and eventually operating either a trackless trolley system or an electric interurban line between the two terminals. C. H. Firestone, R. C. Flack and Otto Stettler are interested.

PORT CLINTON, O.—The Mathews Boat Company has been reorganized under the name of the Mathews Company, and will build new plants for the manufacture of automatic electric lighting plants and other electrical equipment. The capital stock of the new company is $820,000, and the incorporators are S. J. Mathews, Willard Reed, M. C. Cosgray, F. H. Dewitt and G. A. True.

SPRINGFIELD, O.—Arrangements are being made by the Springfield Light, Heat & Power Company for the installation of new equipment next month. A 5,000-horsepower turbine has been ordered, and facilities to greatly enlarge the company's service will be added.

ZANESVILLE, O.—An electric elevator, dumb waiters, lighting fixtures and other equipment will be purchased by the trustees of Bethesda hospital to complete the new building.

MISHAWAKA, IND.—A. G. Barone, of Wilmington, Ill., is interested in a plan to build an electric line from Mishawaka to Indianapolis, the line to pass through Rochester, Logansport and other towns north and south of Rochester. The line, if built, will be of the gas-electric type and will make connections with steam roads along its intended route.

PERU, IND.—The city of Peru will again be owner of the city lighting plant, which has been in possession of G. Conradt for the past six years.

SEYMOUR, IND.—The City Council has granted a franchise to the Commercial

Electric & Power Company, of Seymour, containing several novel features. Under certain conditions the city may buy the plant at any time.

ALBANY, ILL.—K. D. Slocum has petitioned for a franchise to furnish energy for power and lighting purposes.

GALENA, ILL.—The Interstate Light & Power Company is making plans to furnish power to the United States Steel Company for its mine near Schulesburg, and additional power to the Cleveland Mining Company at its mine near Galena. It is estimated that during the next year an additional load of 3,000 horsepower will be added to the company's lines. To serve these additional requirements it will be necessary to further enlarge the generating capacity of the Galena station, for which arrangements are now being made.

MARION, ILL.—The Ohio Valley Electric Company is planning for a large increase in business, and has issued $100,000 in bonds to finance improvements and extensions. The company is now operating a power plant at Norris City and has been very successful. Propositions have been received by the company which will require power plants of larger capacity and equipment to handle this business will be installed at an early date. F. W. Richard, Carterville, is president, and F. H. Wyckes, Marion, is secretary.

MATTOON, ILL.—At an election in April citizens will vote on a proposition to issue $25,000 bonds for a municipal electric lighting plant, to be run in connection with the waterworks.

SPRINGFIELD, ILL.—An ornamental lighting system on Washington and Monroe Streets, from First to Tenth Streets, is under discussion by the City Commission and officials of the Springfield Gas & Electric Company. A plan to put all wires of the city and company underground on these streets also is being discussed.

ALLEN, MICH.—The Allen Electric Lighting & Power Company has been organized here with a capital of $2,000.

EDMORE, MICH.—Plans for development of a hydroelectric power company, to furnish this town with light and power are being made by W. C. Clark, of Pontiac, who has just purchased the lighting plant owned by J. H. Gibbs. Mr. Clark has purchased the water power rights at Riverdale and Sumner, ten miles east on Pine River, and the service will be brought here from those points.

FENTON, MICH.—The Council will place lights on Roberts and Caroline Streets.

IONIA, MICH.—The Ypsilanti Reed Furniture Company is having plans prepared by Wernette, Bradfield & Mead, architects, Grand Rapids, for a 1,000-horsepower plant. The cost will be about $20,000.

MARKESAN, WIS.—Application for a franchise has been applied for by the Markesan Electric Company to furnish energy for light, power and heat in the village of Markesan. The company is incorporated with a capital of $15,000. In the event of the franchise being granted the current will be furnished by the Ripon Light & Water Company from its Ripon plant.

BALATON, MINN.—A franchise has been granted whereby this village and Garvin, Minn., will be furnished with energy for power and lights by the plant at Tracy, Minn.

ST. NICHOLAS, MINN.—The Public Service and Union Power Company of St. Cloud has been granted a franchise to extend their electric lights and power lines into and through this village.

ALBIA, IOWA.—Guy J. Walker, of New York City, has purchased the property of the Southern Light & Railroad Company, which was sold at auction here. He paid $75,000 for the property. The company is now furnishing light to Albia and surrounding villages, and is operating two interurban lines.

ARCHER, IOWA.—Ways and means are being considered for the establishment of an electric light plant here.

CLARKSVILLE, IOWA.—A. D. Van Meter, of the local electric light company, is planning an installation of electroliers on several streets here.

DAVENPORT, IOWA.—Lights on the viaduct spanning LeClaire from Fourth to Federal Streets, are being considered by the City Council.

DELMAR, IOWA.—The City Council will make arrangements to purchase energy for street lighting from the Maquoketa Light & Power Company.

ODEBOLT, IOWA.—The Town Council has decided to light the city with electroliers which will be put in early in the spring.

PERRY, IOWA.—S. D. Henry, owner of the Coon Rapids electric light plant, closed a deal with the Iowa Railway & Light Company and the property in the neighboring town will be taken over by the Cedar Rapids corporation within a short time. The people of Coon Rapids will doubtless be served from the Perry plant when the new building and equipment is installed next summer.

STANHOPE, IOWA.—A petition is being circulated asking for the submission of the question of granting a franchise to the Henderson Light & Power Company, of Jewell.

WAUKON, IOWA.—Mayor P. C. Jones has under consideration the building of a $7,000 electric light plant.

AURORA, MO.—The Lawrence County Water, Light & Cold Storage Company will construct 6,600-volt, 3-phase, 25-cycle transmission line to the substation of the Ozark Power & Water Company.

MT. VERNON, MO.—An election will be held in February to decide the question of issuing $8,500 in bonds to rebuild the electric light plant here.

ST. JOSEPH, MO.—W. E. Winner has obtained a franchise in Clay County for the building of an electric trolley line from North Kansas City to Campbellton. Mr. Winner has organized a company to operate a trolley line from Kansas City to St. Joseph.

WARRENTOWN, MO.—The Warrentown Electric Light, Ice & Power Company contemplates the construction of a 6,600-volt, three-phase transmission line to Wright City.

CUBA, KAN.—E. C. Preble has submitted a proposition to the City Council asking for a franchise to put in an electric light plant here.

GREAT BEND, KAN.—A. E. Fitkin, of the Interstate Electrical Corporation, New York City, owners of the Great Bend Water & Electric Company, recently inspected the work being done on the new plant here, and will recommend the purchase by his company of the power plants at Sterling and Lyons. If the purchase is made the three plants will be tied together.

BLOOMFIELD, NEB.—W. H. Mowrer has sold the local gas and electric company and the new owners have taken charge. F. L. Bates, of Memphis, Tenn., is president of the company, and is here now to oversee the remodeling and repairing of the plant.

SPRINGFIELD, S. D.—The Artesian Light Company is planning on the installation of a larger plant in the spring. J. L. Turner is president.

WALLACE, S. D.—The Town Board has been authorized to grant a franchise to the Bradley Electric Company to extend its lines to this place and furnish energy for light and power. The company, of which R. L. Nordness is secretary, will probably furnish the street lighting system.

HAMPDEN, N. D.—An electric light plant will be installed here.

LINTON, N. D.—The question of issuing bonds for a municipal lighting plant will be submitted to a vote February 19.

DATES AHEAD.

New Mexico Electrical Association. Annual convention, Albuquerque, N. M., February 14-16. Secretary, E. A. Thiele, Roswell, N. M.

Electrical Supply Jobbers' Association. Quarterly meeting, Hotel Statler, Detroit, Mich., February 15-17. Secretary, F. Overbagh, 411 South Clinton Street, Chicago, Ill.

Illinois State Electric Association. Annual convention, Champaign, Ill., February 23-24. Secretary, H. E. Chubbuck, Peoria, Ill.

New England Section, National Electric Light Association. Question-Box convention, Boston, Mass., March 8 and 9. Secretary, Miss O. A. Bursiel, 149 Tremont Street, Boston, Mass.

Wisconsin Electrical Association. Annual convention, Hotel Pfiister, Milwaukee, Wis., March 16 and 17. Secretary, George Allison, First National Bank Bldg., Milwaukee, Wis.

American Society of Mechanical Engineers. Spring meeting, New Orleans, La., April 11-14. Secretary, Calvin W. Rice, 29 West Thirty-ninth Street, New York City.

American Electrochemical Society. Semi-annual meeting, Washington, D. C., April 27-29. Secretary, J. W. Richards, Lehigh University, South Bethlehem, Pa.

Arkansas Association of Public Utility Operators. Annual convention, Little Rock, Ark., May 9-11. Secretary, R. B. Fowles, Pine Bluff, Ark.

National Electric Light Association. Annual convention, Chicago, Ill., May 22-26. Secretary, T. C. Martin, 29 West Thirty-ninth Street, New York, N. Y.

National Electrical Contractors' Association of the United States. Annual convention, Hotel McAlpin, New York City, July 18-22. Secretary, H. Duffield, 41 Martin Building, Utica, N. Y.

SOUTH CENTRAL STATES.

CAMPBELLSBURG, KY.—This city has advertised a light, heat and power franchise for sale. Louis Coblin is in charge of the project.

CRAB ORCHARD, KY.—A lighting franchise will be sold here on March 7. It has been drafted by K. S. Alcorn, of Stanford, Ky., and the project is being engineered by H. G. Skiles and Morris Perkings, of Crab Orchard.

LAGRANGE, KY.—Owing to the refusal of Mayor French to sign an order for payment of the local lighting concern, owned by S. R. Schaff, of Louisville, the town is in darkness. The company declines to provide service until a ninety-day bill, past due, is paid. Negotiations for a new franchise are on.

LONE OAK, KY.—S. M. Ware & Son announce that they will install a generating equipment to supply this village of 200 people with power and light. The cost will be about $2,000.

LOUISVILLE, KY.—The Gas & Electric Company has been incorporated here with a capital of $30,000, by Fred Letz, R. A. McDowell and others.

LOUISVILLE, KY.—Operations have been begun in construction of the new plant of the Louisville Gas & Electric Company to be an addition to the present plant. The excavation contract has been let, and work has commenced, considerable blasting being required to dislodge the old concrete foundations of buildings formerly on the site. The contract to the General Electric Company amounts to $125,000. The permit for construction of the new intake and outlet tubes has been obtained, and these will be built in the late summer when the river is low. Instead of tunneling, as formerly when the first intake was constructed, the work will be handled by an open trench, to be covered thereafter.

MT. STERLING, KY.—Members of the General Council heard a discussion on the subject of the projected municipal lighting plant from Edward B. Kay, civil engineer, of Tuscaloosa, Ala. He stated that the city could build and operate its own plant on the $385 per month it is now paying for service.

WHITESBURG, KY.—J. J. Bell, of Lexington, Ky., has been here to interest this city in electric lights, waterworks and other modern utilities.

OXFORD, MISS.—The city is planning to install a 150-kilowatt generator and engine, direct connected. J. H. Lawshire is receiving proposals.

KNOXVILLE, TENN.—According to Mayor J. E. McMillan a municipal lighting plant here is being considered by the City Commission. It is believed an adequate plant could be built for $300,000.

ARDMORE, OKLA.—The Southwestern Public Service Company has been incorporated with a capital of $50,000 by J. L. Hamon, of Ardmore; W. F. Kerr, of Oklahoma City, and others.

RINGLING, OKLA.—Mayor Frank L. Ketch has called an election for February 25 at which will be submitted the question of whether a franchise shall be granted to the Southwestern Public Service Company to install an electric light plant here.

STRATFORD, OKLA.—The Council is planning ways and means to provide electric lighting.

TULSA, OKLA.—Besides making various extensions, the Sand Springs Electric Railway will double track its road between Sand Springs and this city.

BALLINGER, TEXAS.—The Interstate Electric Corporation of New York has purchased the local electric light and power plant from the Ballinger Cotton Oil Company. The plant wil be enlarged and a

system of power transmission lines built to other towns in this section.

COLUMBUS, TEXAS.—The Texas Airline Interurban Company is being organized for the purpose of constructing an interurban electric railway between Columbus and Gonzales and between Austin and Port Lavaca. Part of the right of way has been obtained and construction work will be started in a short time, according to Ben B. Hunt, of Columbus, who is promoting the project.

TROUP, TEXAS.—The Troup Light & Power Company will install a 50-horsepower oil engine and a 40-kilowatt generator.

WESTERN STATES.

HELENA, MONT.—Announcement has been made here by F. M. Kerr, of Butte, general manager of the Montana Power Company, that as soon as the present cold snap moderates a preliminary survey will be made looking to the construction of the Holter power plant, 30 miles northwest of Helena, on the Missouri River, and three miles from Wolf Creek. Work on the project was begun in 1908 by the Missouri River Power Company and suspended in 1910, when financial difficulties overcame the concern. The original plans called for a plant generating 60,000 horsepower, with a dam across the Missouri River 1,400 feet long at the highest elevation and of an average height of 130 feet. Its construction will require 300,000 yards of masonry and 1,500 tons of steel. Seven main hydraulic units, three exciter units and an auxiliary unit are provided for in the original plans. The dam and power plant will cost from $3,000,000 to $3,500,000 and will take from two to two years and a half to build. The building of the dam will create an immense lake, 25 miles in length, the waters being backed up through Picnic Canyon.

HINSDALE, MONT.—The electric power plant here was completely destroyed by fire recently. Arrangements to rebuild are now being made.

MISSOULA, MONT.—Bids will be received February 16 for furnishing and maintaining for one to three years, 46 arc lights along Higgins Avenue, in special lighting district No. 1. L. E. Harris, City Clerk, will furnish information in regard to the bids.

PUEBLO, COLO.—The Arkansas Valley Railway, Light & Power Company will furnish additional power to the Rocky Ford, Colo., water plant, where new pumps are being installed.

KINGMAN, ARIZ.—A power line is to be extended to the Big Jim mining property by the Desert Water & Power Company. A transformer house will be constructed and power furnished for driving machine drills, hoist and compressor.

PHOENIX, ARIZ.—Burns & McDonnell, consulting engineers, Inter-State Building, Kansas City, Mo., are preparing plans for a new municipal electric lighting and gas plant, to cost approximately $750,000. George W. Barrows is chairman of the committee in charge of the project.

WALLACE, IDA.—A snow slide carried away part of the Thompson Falls power line, which furnishes power to the Hercules, Tamarack and other mines. Repairs will be made immediately.

EVERETT, WASH.—The City Council has instructed the City Clerk to make application to the United States Forestry Department for a preliminary power permit in Sultan Canyon. This step will be the first to be taken to secure municipal power and lighting facilities for the city. Investigations made by the City Engineering Department in Sultan Canyon for power sites have shown the project to be feasible.

SEATTLE, WASH.—A bill instructing City Engineer Dimock to ascertain the possibilities of the development of the Sauk-Suiattle power site has been introduced in the City Council, and another bill is before the Council declaring the intention of the city of Seattle to proceed with the development of the site. According to reports, the American Nitrogen Company, recently organized to manufacture compounds from atmospheric nitrogen, desires this site, and C. J. Buck, Acting District Forester, has notified the city that the Nitrogen Company will file on the Sauk-Suiattle site unless the city takes advantage of its prior rights. City Engineer Dimock and other city officials are in favor of the city acquiring and developing this site, which is considered extremely valuable.

SPOKANE, WASH.—The City Engineer has been instructed to proceed with plans for the lighting of Sprague Avenue.

TACOMA, WASH.—In a report to the City Council, B. W. Collins, Superintendent of Electric Works, stated the cost of extending lighting service of the municipal lighting plant to Day Island, to serve residents in that district, will be $1,264.79. It is understood the municipal plant will make the extension.

WALLA WALLA, WASH.—Announcement has been made that improvements will be made in the power plant of the Pacific Light & Power Company so that continuous service will be furnished in the future.

DREWSEY, ORE.—The installation of the electric lighting system is being planned for this city by George L. Baker and Charles Miller. It is understood the installation will be made as soon as weather conditions permit and materials can be placed on the ground.

PORTLAND, ORE.—The City Council has granted permission to business men and property owners on First Street, between Morrisson and Yamhill Streets, to install a cluster lighting system in that section of the city.

LOS ANGELES, CAL.—The Department of Public Service will receive bids up to February 15 for electric meters.

LOS ANGELES, CAL.—The Board of Supervisors has called for bids for maintaining the street lighting system in the Bairdstown Lighting District.

RED BLUFF, CAL.—The Board of Trustees has adopted plans and specifications for a street lighting system for Main Street from Elm to Hickory. The cost is estimated at $2,700.

REDLANDS, CAL.—New arc-lights are to be installed here by the Southern California Edison Company.

SAN FRANCISCO, CAL.—Two large submarine cables have just been laid across San Francisco Bay by the Pacific Gas & Electric Company. The cables extend from the Exposition grounds across the bay to Marin County.

MARTINEZ, CAL.—Construction of the electric railroad between Martinez and Concord, giving connection with both the Oakland, Antioch & Eastern and the Santa Fe railroads, will start within 30 days, according to a statement made by Clifford McClellan to the Martinez Development Board. The line and its equipment will cost $150,000.

YREKA, CAL.—The California-Oregon Power Company, which supplies 34 communities in Northern California and Southern Oregon with electric light and power, is building an additional plant on the Klamath River to generate 53,000 horsepower.

CANADA.

QUEBEC, QUE.—Details of the project of the new Vercheres, Chambly & La Prairie Tramways Company, which proposes to capitalize at $500,000 and operate an electric railway system between South Shore towns and Montreal, were presented in a bill to the Legislature. J. W. Domville, Rosemere; Alfred Colas, Longueill; D. W. Ogilvie, Ernest Pitt and Edmond Ducharme, Montreal, are named as provisional directors of the company.

RIGAUD, QUE. — Extensive improvements are to be made in the lighting system here by the North Shore Electric Company.

MEXICO.

BOQUILLA, CHIHUAHUA.—The Mexican Northern Power Company will soon resume work on their large power project here. The big dam across the Conchos River came through the revolutions unscathed and the hydroelectric plant and power transmission line will be built as rapidly as possible.

Financial Notes

The Columbus Railway Power & Light Company has called at 101 and interest on August 1, 1916, the $182,000 6-per-cent first-mortgage bonds of the Columbus Public Service Company, due February 1, 1924.

Kings County Electric Light & Power Company, Brooklyn, N. Y., at a meeting of the Board of Directors, declared a regular quarterly dividend of 2 per cent on the amount of the capital stock outstanding, payable on March 1, 1916, to stockholders of record at 3 p. m. on February 10, 1916.

Detroit United Railway Company has sold to William A. Read & Company, New York City, the $3,500,000 three-year-and-two-months 5-per-cent trust notes recently approved by the Michigan Railroad Commission. Of the proceeds of the notes $2,000,000 will be used to take up the $2,000,000 two-year 6-per-cent notes due February 5, 1916, and $1,000,000 to retire the $1,000,000 Detroit Electric Consolidated 20-year 5-per-cent bonds due June 1, 1916, leaving $500,000 available for improvements and extensions to property of the company. It is understood that the entire issue of the notes has been sold to investors by the purchasing house.

Net profits equal to 11.7 per cent on its $27,000,000 capital stock are reported by the Chicago Telephone Company for the year ended December 31 last, compared with 9.5 per cent in 1914. The income account compares as follows:

	1915	1914
Operating revenues	$17,559,533	$16,229,368
Operating expenses	12,425,604	11,841,477
Net operating revenue	5,133,929	4,387,890
Net income	3,163,047	2,570,596
Div'd approp'n of inc.	2,160,000	2,160,000
Other approp'ns of inc.	206,000	4,375
Surplus	797,047	406,221

On Dec. 31, 1915, the company had a total of 504,124 telephones in service.

Dividends.

	Term	Rate	Payable
Boston Elevated	Q	1.5 %	Feb. 15
Detroit United Ry.	Q	1.5 %	Mar. 1
Elec. Co. of Am.	—	25c	Feb. 17
Kings Co. Elec. Lt. & Pw.	Q	2 %	Mar. 1
•Marconi Wireless Teleg.	—	7 %	.....
†Marconi Wireless Teleg.	—	5 %	.....

•Dividend on cumulative participating preference shares for 1915, payable on and after February 1. †An interim dividend for 1915 on the ordinary shares, payable on and after February 1.

Reports of Earnings.

PACIFIC GAS & ELECTRIC.

	1915	1914
December gross	$1,622,941	$1,549,457
Net after taxes	696,892	659,648
Total income	755,305	676,484
Surplus after charges	434,112	402,931
Balance after bond discount and expense	420,383	359,957
12 months' gross	18,530,301	16,912,688
Net after taxes	7,944,708	6,998,766
Total income	8,358,587	7,306,582
Bond interest	3,982,419	3,890,341
Interest on notes and floating debt	2,992	301,060
Discount and expenses	160,410	469,515
Surplus	4,212,766	2,645,666
Dividends first preferred	400,717	14,983
Dividends original preferred	600,000	600,000
Balance	3,212,050	2,030,682

Included in gross for December is $33,869 in dispute on account of rate litigation as compared with $34,866 in December, 1914, while for the 12 months there is included in

CLOSING BID PRICES FOR ELECTRICAL SECURITIES ON THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

	Feb. 7	Jan. 31
American Tel. & Tel. (New York)	126⅞	127
Commonwealth Edison (Chicago)	144¾	144½
Edison Electric Illuminating (Boston)	244	242
Electric Storage Battery common (Philadelphia)	63	63
Electric Storage Battery preferred (Philadelphia)	63	63
General Electric (New York)	170½	170½
Kings County Electric (New York)	128	128
Massachusetts Electric common (Boston)	6	6
Massachusetts Electric preferred (Boston)	36¼	35¾
National Carbon common (Chicago)	179	179
National Carbon preferred (Chicago)	—	—
New England Telephone (Boston)	135¾	132
Philadelphia Electric (Philadelphia)	28	28
Postal Telegraph and Cables common (New York)	81½	79
Postal Telegraph and Cables preferred (New York)	66	65½
Western Union (New York)	87⅞	88¾
Westinghouse common (New York)	66	65½
Westinghouse preferred (New York)	76	75

gross $398,288 in dispute as compared with $554,362 in the preceding 12 months.

Operating expenses for December in addition to maintenance charges of $73,926 include depreciation charges of $130,000, while for the 12 months in addition to maintenance of $970,886 charged operating costs there was also charged $1,380,000 for depreciation.

DETROIT EDISON.

	1915	1914
December gross	$881,856	$714,422
Net	410,553	322,466
Surplus after charges	310,391	240,718
Twelve months' gross	7,759,932	6,495,815
Net	2,948,713	2,301,064
Surplus after charges	1,848,658	1,418,751

SOUTHERN CALIFORNIA EDISON.

	1915	1914
December gross	$ 412,912	$ 397,314
Net after taxes	221,301	204,320
Total income	239,793	217,676
Surplus after charges	163,641	175,035
Balance after depreciation	83,641	95,035
Twelve months' gross	4,808,606	4,755,632
Net after taxes	2,589,989	2,424,468
Total income	2,714,498	2,522,976
Surplus after charges	1,711,317	1,630,966
Balance after depreciation	1,011,317	930,966

MONTANA POWER.

Montana Power Company reports earnings for three months and twelve months ended December 31, 1915, as follows:

	1915	1914
Three months' gross	$1,375,212	$ 921,256
Net after taxes	1,046,224	626,986
Surplus after charges	710,253	379,344
Twelve months' gross	4,359,407	3,778,286
Net after taxes	3,167,505	2,639,239
Interest charges	1,189,162	1,063,614
Preferred dividends	677,026	677,026
Depreciation	300,000	.....
Surplus	*1,001,316	898,599

*Equivalent to 3.72 per cent on the common stock as compared with 3.34 per cent in 1914.

DAYTON POWER & LIGHT.

Dayton Power & Light Co. reports for December, 1915, and the fiscal year ended December 31, 1915, as follows:

	1915	1914
December gross	$ 131,580	$ 96,944
Net after taxes	62,183	44,623
Surplus after charges	44,361	27,649
Balance after preferred dividends	32,177	17,402
Twelve months' gross	1,098,065	943,321
Expenses and taxes	579,582	528,151
Net earnings	518,483	415,170
Other income	12,987	11,842
Total income	531,471	427,012
Interest charges	198,765	192,647
Sinking fund charges	19,167	15,000
Surplus	313,539	219,365
Preferred dividends	128,347	116,219
Balance	*185,192	103,145

*Equivalent to 6.06 per cent on $3,053,000 common stock as compared with 3.37 per cent in 1914.

Proposals

GENERATOR.—Sealed proposals will be received March 1 for a new engine and generator in the United States postoffice and courthouse at Philadelphia, Pa. Address James A. Wetmore, Acting Supervising Architect, Washington, D. C.

ELECTRICAL WORK.—Sealed proposals will be received February 15 at Room 406, City Hall, Chicago, Ill., for furnishing all labor and material, and for doing all the electrical work required in the construction of additions to the Washington Heights Swimming Pool, located at Vincennes Road and 104th Street, according to plans and specifications on file in the office of the Department of Public Works, W. R. Moorhouse, Commissioner.

ELECTRIC PASSENGER ELEVATOR.—Sealed proposals will be received at office of the Supervising Architect, Treasury Department, Washington, D. C., until February 29, for the installation, complete, of an electric passenger elevator in the United States postoffice and courthouse at Martinsburg, W. Va. Copies of drawings and specifications may be obtained on application to the custodian of the site at Martinsburg, or at the Supervising Architect's Office, Washington.

ELECTRICAL SUPPLIES.—Bids will be received at the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., for furnishing supplies at naval stations: Schedules 9282 and 9283—Mare Island, Cal., 5,000 feet telephone cable, 1 15-horsepower induction motor and 5 transformers. Schedule 9279—Brooklyn, N. Y., 1,000 Leyden jars and 1,000 feet single-wire conductor; Philadelphia, Pa., 1,500 plugs and 800 sockets. Schedule 9274—Brooklyn, N. Y., 25,000 feet telephone wire. Bidders desiring to submit proposals should make application for schedules to the Bureau or any Navy Purchasing Office.

New Incorporations

FRANKLIN SPRINGS, N. Y.—Progressive Electric Light Company. Capital, $6,000. Incorporators: J. B. Coleman, C. B. Van Slyke and others.

NEW YORK, N. Y.—D. & D. Electric Company. Capital $10,000. Electrical machinery. Incorporators: D. Strulson, A. Chazick and others.

BOSTON, MASS.—Legalite Corporation. Capital, $5,000. Manufacture electrical automobile appliances. Incorporators: R. H. Holman, F. D. Shenk and others.

BAKERSFIELD, CAL.—The Pacific Light & Power Corporation. Capital, $40,000,000. Incorporators: W. G. Kerchoff, Charles Forman, Kaspare Cohn, W. N. Kemp, G. S. Patten and H. E. Huntington.

Foreign Trade Opportunities

[Addresses may be obtained from the Bureau of Foreign and Domestic Commerce, Washington, D. C., or its offices at Boston, New York, Atlanta, Chicago, St. Louis, New Orleans, Seattle and San Francisco. Write on separate sheet for each item and give file number.]

NO. 19,913. LAMP SOCKETS.—A commercial agent of the bureau transmits an inquiry from a firm in Switzerland which desires to purchase electric-lamp sockets, both with and without key. Samples, catalog and full information should be sent.

NO. 19,926. ELECTRIC LAMPS, BULBS, AND ACCESSORIES.—A commercial agent of the bureau transmits an inquiry from a firm in the Netherlands which desires to receive samples, prices and full information from American manufacturers of tungsten metal filament electric lights, bulbs for electric lights and accessories for same.

NO. 20004. ELECTRICAL APPARATUS.—An American consular officer in Switzerland reports that a firm in his district desires to receive catalogs, price lists and full information from American manufacturers of electrical apparatus for motor-car lights, including cranking, lighting, and ignition device.

NO. 20022. WIRELESS APPARATUS.—An American consular officer in Central America desires to receive quotations, f. o. b. steamer New Orleans, on a 3 to 5 kilowatt, 500-cycle wireless transmitter, with complete modern receiving set. The transmitter should be equipped with either quenched or synchronous rotary spark gap and capable of transmitting a distance of 250 miles. The power is to be furnished by a mining power plant. A 200-foot mast or tower will be furnished by the purchaser. Cost of installation should be included in quotations.

New Publications

TRANSMISSION LINES.—"The Exact Calculation of Electric Transmission Lines with Distributed Dielectric Admittance and the Complex Hyperbolic Method," by A. E. Salazer, of the University of Chili, which was presented at the Second Pan-American Scientific Congress, has been published in pamphlet form by the author in Spanish, accompanied by an English abstract.

MAGNETIC OBSERVATIONS.—The United States Coast and Geodetic Survey has issued publication No. 19 entitled "Results of Observations Made at the Magnetic Observatory at Cheltenham, Md., 1913 and 1914," by Daniel L. Hazard. Detailed observations, with monthly and annual means, are given of the three components of the earth's magnetic field. There are also records of earthquakes and magnetic storms.

Electrical Patents Issued February 1, 1916

Prepared by Thomas Howe, Patent Attorney, 2 Rector Street, New York, N. Y.

1,169,788. Secondary or Storage Battery. B. Ford, Philadelphia, Pa. Jar cover made tight.

1,169,798. Lug. R. A. Goeller, New York, N. Y. For soldering to cable end; detachable exterior shell is finished.

1,169,799 and 1,169,800. Machine-Switching Telephone-Exchange System. C. L. Goodrun, assignor to Western Electric Co., New York, N. Y. First patent: Arrangement of relays and magnets for operating selector switch. Second patent: Same for finder switch.

1,169,817. Method of Carrying Out Gas Reactions in an Electric Furnace. A. Helfenstein, Vienna, Austria-Hungary. Manner of producing reactions at high temperatures in electric low-tension furnaces.

1,169,819. Process of Preparing Metallic Filaments. R. H. Henderson, assignor to Westinghouse Lamp Co., E. Pittsburgh, Pa. Preparing structures containing metal with high fusing point.

1,169,824. Apparatus for Electrically Treating Air. W. T. Hoofnagle, assignor to Electro-Chemical Products Co., New York, N. Y. Automatically controlled current, passed through closed reaction chamber containing the air or gas.

1,169,825. Method and Apparatus for Making Ozone. W. T. Hoofnagle, assignor to Electro-Chemical Products Co. Air, rapidly checked and released in flow to produce surging in reaction chamber where current is passed through it.

1,169,827. Electrical Stove. G. A. Hughes, assignor to Hughes Electric Heating Co., Chicago, Ill. Structure of oven, etc., and arrangement of resistor.

1,169,851. Gas Lighter and Extinguisher. H. G. Mead, Shrewsbury Park, Mo., assignor of one-half to J. J. Hartley, St. Louis, Mo. Electromagnetically operated valve and spark lighter.

1,169,853. Adjustable Shade. S. R. Menssen, Platte Center, Neb. For securing to socket; has adjustable wings.

1,169,865. Contact Shoe for Third-Rail Electric Cars. C. F. Raydure, West Philadelphia, Pa. Structural details.

1,169,866. System for Supplying Electricity. I. J. Reuter, assignor to Remy Electric Co., Anderson, Ind. Generator supplies constant potential for automobile lighting; potential increases with speed for ignition.

1,169,885. Vehicle Signal. J. F. Sullivan, New York, N. Y. Shutter of automobile light controlled conjunctively with brake pedal.

1,169,890. Selector Switch. L. V. Nagy, assignor to Western Electric Co., New York, N. Y. Structural details of contacts and operating means.

1,169,893. Apparatus for Use in Producing Synthetic and Chemical Substances. J. R. Watson, Baltimore, Md. Electrically-heated rotary retort.

1,169,894. Automatic Telephone System. H. G. Webster, assignor to Kellogg Switchboard & Supply Co., Chicago, Ill. Arrangement of contacts and magnets for operating selective switch.

1,169,932. Electric Fixture Attachment. S. E. Cressey, San Pedro, Cal. Detachable clamp with conductors supports lamp.

1,169,937. Electrical Device for Changing the Direction of Rotation of Shafts. M. J. Dikeman, Detroit, Mich. Electromagnetically controlled differential gears.

1,169,942. Arc Light Electrode. E. Egly, assignor to Gebrueder, Siemens & Co., Lichtenberg, Germany. Has illuminating ingredient comprising cerium peroxid, calcium oxid and a fluorid.

1,169,943. Colloidal-Manganese-Dioxid Depolarizer. C. Ellis, Montclair, N. J. For Leclanche batteries; comprises higher oxid of manganese cemented to carbon particles by colloidal manganese dioxid.

1,169,949. Cable Construction. B. W. Gates, Washington, D. C. Paper-filled, multiple-conductor cable.

1,169,953. Glass-Shaping Apparatus. A. F. Gumpp and W. J. Johnson, Smithport, Pa. Electromagnetically operated forming apparatus.

1,169,954. Clothes-Drying Machine. M. B. Haliday, Wallkill, N. Y. Motor and gearing enclosed in base.

1,169,957. Circuit Controller. W. S. Henry, assignor to General Railway Signal Co., Gates, N. Y. Details of rock-lever switch.

1,169,960. Device for Mounting Electric Wires. G. P. Jacobson, Lanse, Pa. Insulated clamp structure.

1,169,991. Electric Signaling System. W. C. Neahr, assignor to Protective Signal Mfg. Co., Denver, Colo. Railway signal controlled by normally closed circuit having switch operated by passing vehicle.

1,169,992. Circuit-Controlling Instrument. W. C. Neahr, assignor to Protective Signal Mfg. Co. Car-wheel-operated switch related to above.

1,169,993. Book Fumigator. R. Oldham, Salt Lake City, Utah. Has alarm circuit for indicating when treatment of book in closed chamber is completed.

1,170,000. Insulating Enamel. F. A. Robinson, assignor to D. W. Armistead, Aurora, N. Y. Elastic, flexible material consisting of hardened preparation of residuum of oil from a pinnipedic or cetaceous animal.

1,170,012. Portable Electric Searchlight. R. L. Smith, Everett, Mass. Stand, carrying reflector, lamp and handle, is mounted on storage battery.

1,170,017. Fault-Locator for Electric Cables. H. M. Stoller, assignor to Western Electric Co. Device for exploring the field of electric cable conductors.

1,170,032. Lock for the Gates of Elevator Shafts. W. A. Williams, Barton, O. Latch controls circuit of signal and indicator.

1,170,033. Circuit Controller. M. Wuerpel, assignor to General Railway Signal Co. Controller drum built up of interlocking sections.

1,170,034. Electrical Connector. W. H. Adams, Kenyon, R. I. Special structure providing flexible connection between stationary cable and movable contact apparatus.

1,170,048. Distributing System. J. T. Cowley, assignor to Lamson Co., Boston, Mass. Parcel delivery system.

1,170,063. Circuit-Closer. H. J. Heeney, assignor to Holtzer-Cabot Electric Co., Brookline, Mass. Details of tubular, push-button switch.

1,170,091. Mail-Distributing Machine. B. S. Molyneux, assignor to C. H. Bierbaum, Buffalo, N. Y. Electrically operated.

1,170,112. Service and Meter Testing and Connection Block. J. Sachs, Hartford, Conn. Special arrangement of contacts and connectors for connecting in testing apparatus.

1,170,113. Electric-Meter-Testing Switch. J. Sachs. Multiple connectors operated separately or together to produce desired testing connections.

1,170,132. Welded Rail Bond and Fish Plate. J. M. Yount, San Francisco, Cal., assignor of one-half to T. Finigan, San Francisco, Cal. Special structure and arrangement of welded fin-plates.

1,170,143. Railway Signaling System. A. Dulac, Gardiner, Me. Combination of home and distant-signaling stations with clock mechanism for indicating and recording time of arrival of cars at stations.

1,170,153. Metal-Rolling Machinery. C. T. Henderson, assignor to Cutler-Hammer Mfg. Co., Milwaukee, Wis. Driving motor automatically controlled by material passing through rolls.

1,170,153. Mechanically Actuated Horn or Alarm. M. R. Hutchinson, assignor to Lovell-McConnell Mfg. Co., Newark, N. J. Has motor-operated diaphragm vibrator. (See cut.)

1,170,165 and 1,170,166. Electrical Heating Unit. F. Kuhn, assignor to American Electrical Heater Co., Detroit, Mich. First patent: For sad irons. Second patent: Flat resistor has lateral heat distributing wings.

1,170,167. Terminal Contact-Plug. F. Kuhn, Detroit, Mich. Armored with resilient conductor guard.

1,170,168. Connector for Electrically Heated Instruments. F. Kuhn and F. E. Shailor, assignors to American Electrical Heater Co. For sad irons.

1,170,169. Electrical Food-Warmer. F. Kuhn and F. E. Shailor, assignors to American Electrical Heater Co. Electric heater arranged in base of cup.

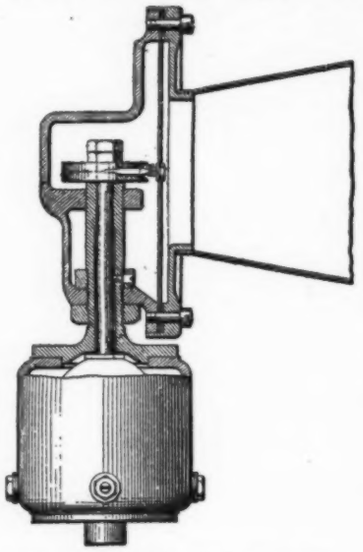
1,170,170. Electrically Heated Glue Pot. F. Kuhn and F. E. Shailor, assignors to American Electrical Heater Co. Connections, etc., for resistor on bottom of pot spaced from enclosing casing.

1,170,184. Separation of Liquid Suspensions. F. W. Peek, Jr., assignor to General Electric Co., Schenectady, N. Y. Suspended water removed from oil by passing through alternating electrostatic field varying in intensity at different points.

1,170,190. Electric Switch. F. J. Ravlin, Chicago, Ill. Plug-switch receptacle member.

1,170,192. Cooling Dynamos. R. Rudenberg and A. Zehrung, assignors to Siemens-Schuckertwerke G. M. B. H., Berlin, Germany. Air passed through hollow stator conductors in opposite directions.

1,170,196. Controlling Mechanism for Automobile Starting Motors and Lighting Generators. G. E. Stevens, assignor to General Electric Co. Switch in circuit of dynamo-electric machine connected to engine shaft, interlocked with transmission.

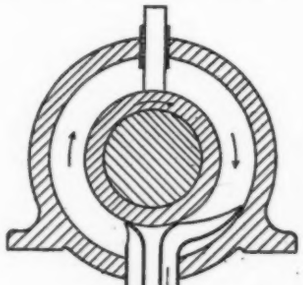


No. 1,170,158.—Motor-Driven Horn.

1,170,201. Transformer. J. M. Weed, assignor to General Electric Co. Details of core structure.

1,170,203. Air Pump for Vacuum Cleaners. T. Wiedemann and J. H. Templin, assignors to Santo Mfg. Co., Philadelphia, Pa. Mounting and connection of motors.

1,170,211. Split-Phase System. E. F. W. Alexanderson, assignor to General Electric Co. Combination of transformer secondary sections and phase converter.



No. 1,170,444.—Cooling Device for Dynamos.

1,170,235. Adjustable Lamp Support. F. A. Fox, Philadelphia, Pa. For dentists' chairs and the like.

1,170,247. Anticathode for Röntgen Ray Tubes. M. Gundelach, Gehlberg, Germany. Of metallic uranium.

1,170,260. Lightning Rod. A. G. Hoovens, Goshen Ind. Structure of vertical point tube.

1,170,275. Ignition System. C. F. Kettering, assignor to Dayton Engineering Laboratories Co., Dayton, Ohio. Ignition circuit operated from two sources of high and low potential, respectively.

1,170,287. Method of Making Insulators. J. S. Lapp, assignor to Locke Insulator Mfg. Co., Victor, N. Y. Metallic and vitreous sections united by hydraulic cement set at high temperature.

1,170,313. Process of Burning Carbon Electrodes. F. Nagelschnitz, assignor to the firm of Georg Mendhein, Munich, Germany. Electrode material with tar binder heater and expelled gases collected and ignited.

1,170,323. Telephone-Signal-Operating Device. F. E. Phillips, Wells, Me. Signal lamp is lighted when instrument is in use.

1,170,347. Means for Operating Switch Mechanisms. R. A. Schoenberg, assignor to I. S. Rosenheim, New York, N. Y. For sockets; operated by longitudinal movement of plug.

1,170,352. Electric Lamp and Its Fittings. H. E. Sheward, Winchmore Hill, England. Socket, plug and bracket details.

1,170,356. Telephonic Apparatus. H. Smith, assignor to G. Kiorboe, Copenhagen, Denmark. Structure and arrangement of granule chambers in microphone.

1,170,359. Electrically Operated Pump. M. E. Swortzel, Waynesboro, Va. Piston operated by motor solenoids.

1,170,360. Holding Device. J. D. Taylor, assignor to Union Switch & Signal Co., Swissvale, Pa. For railway signals; comprises stator with single-phase winding and squirrel-cage rotor having same number rods as stator has poles.

1,170,361 and 1,170,362. Railway Signal. J. D. Taylor, assignor to Union Switch & Signal Co. First patent: transformer device for moving and holding signal. Second patent: modification.

1,170,388. Electrical Contact. H. A. Kaempfe, Meumuhlen, near Kiel, Germany. Contact improved between a pin and its bearing by mercury secured by capillary attraction.

1,170,407. Testing Device for Spark Plugs. W. Brown, Oglesby, Ill. Comprises contacts and sight spark gap for application to plugs.

1,170,421. Receiver-Holding Attachment for Telephones. W. A. Delano, New York, N. Y., and E. R. Belmont, Hempsted, N. Y. Receiver-holding clip clamped to transmitter.

1,170,444. Cooling Device for Dynamos. W. Gscheidlen, assignor to Siemens-Schuckertwerke G. M. B. H., Berlin, Germany. For sliding contacts in dynamo-electric machines; has cooling space, intake and exhaust nozzles bent in opposite directions. (See cut.)

1,170,480. Cash Register. J. J. Duffie, San Francisco, Cal. Has series of lamps and circuits operated on actuation of register to produce a given character.

1,170,483. Track System for Controlling Trains. A. Gollos, Chicago, Ill., assignor to Gollos Railway Signal Co. Arrangement of sections in block system.

PATENTS EXPIRED.

The following United States electrical patents expired on February 7, 1916:

618,837. Conduit for Wire or Cables. E. H. Calloway, New York, N. Y.

618,848. Electric Arc Lamp. W. E. Dennis, New York, N. Y.

618,853. Brush Holder for Dynamo-Electric Machines. G. S. Dunn, East Orange, N. J.

618,864. Apparatus for Operating Electric Brakes. H. S. Graber, St. Louis, Mo.

618,876. Circuit-Breaker and Closer. A. T. Hill, Detroit, Mich.

618,911. Trolley Connection for Canal Boats. F. J. Shewring, Toronto, Can.

618,935. Rotating Electric Motor. W. P. Freeman, New York, N. Y.

618,950. Lightning Arrester. E. C. Parham, Johnstown, Pa.

618,992. Cleaner for Commutators. J. T. Morrow, Great Falls, Mont.

618,993. Electrical Battery. L. Paget, New York, N. Y.

619,014. Electric Arc Lamp. T. E. Drohan, Chicago, Ill.

619,023. Torpedo-Controlling Device. W. D. Litchfield, Somerville, Mass.

619,028. Electrochronograph. C. W. Thomson, LaCrosse, Wis.

619,038. Automatic Electric Signal for Railway Crossings. U. J. Fry, Milwaukee, Wis.

619,090. Electric Arc Lamp. A. Schweitzer, Allegheny, Pa.

619,091. Automatic Magnetic Circuit-Breaker. W. M. Scott, Philadelphia, Pa.

619,100. Electric Crane. W. R. Thomas and J. Thomas, Catasauqua, Pa.

619,157. Composite Signaling and Transmission System. S. D. Field, Stockbridge, Mass.

619,187. Prepayment Mechanism for Electric Meters. J. C. Kinney, San Antonio, Tex.

619,217. Electric Motor. O. H. Pieper and A. F. Pieper, Rochester, N. Y.

619,240. Toll Counter for Telephonic Circuits. G. K. Thompson, Malden, Mass.